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FRAMING EFFECTS ON TIME PREFERENCES: THE IMPACT OF INVESTMENT AND LOAN CONTEXTS IN INTERTEMPORAL CHOICES

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Abstract

Our decisions frequently involve the combinations of gains and losses occurring at different points in time, such as enduring early losses for future gains (investments), or enjoying immediate gains at the expense of future losses (loans). This study introduces novel experiments that examine how binary intertemporal payment options, framed as either investments or loans, influence decision-making. Each option comprised two payment components: common payments, which are identical between the options, and main payments, which vary between the options. Through strategic manipulation of these payments, the study explores how investment or loan frames affect time preferences. Our studies consistently indicate that the common payments tend to be disregarded, thus the preferences are affected by framing. Notably, this remained true even when common payments were substantial (Study 2), and the framing effect was also found in scenarios where decisions carried real financial consequences (Study 3).

Keywords: time preferences, framing, cancellation

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Time preferences involving gains and losses are crucial in many decision-making processes. Researchers have extensively studied the discounting behaviors associated with time preferences in gain and loss domains, and findings suggest that these preferences differ. Individuals tend to discount future outcomes more heavily in gain domains compared to loss domains (e.g., Benzion et al., 1989; Ikeda et al., 2010; MacKeigan et al., 1993; Molouki et al., 2019; Thaler, 1981). This phenomenon is commonly referred to as the *sign effect* (Frederick et al., 2002).

Intertemporal decision-making often entails trade-offs between gains and losses, which we can classify into two distinct domains in this paper: the investment domain and the loan domain. The investment domain involves losses sooner and gains later. Such situations include instances where individuals forego immediate consumption of enjoyable goods or services to save money, with the expectation of receiving greater benefits in the future. This is commonly observed in contexts such as pension plans and investment portfolios. Conversely, the loan domain involves gains sooner and losses later. Such situations include instances where individuals make purchases using credit, enjoying immediate gains in the form of goods or services, but incurring future losses when they must repay the borrowed amount, as seen in contexts like credit card debt and mortgages. Despite the apparent importance of these domains, the difference in time preferences between them has not been thoroughly explored, except in a few studies (Meissner & Albrecht, 2022; Schleich et al., 2021; Walters et al., 2016). These studies have shown that debts from loans are discounted at a lower rate than returns from investments, a phenomenon referred to as saving-borrowing asymmetry or debt aversion. Meissner and Albrecht (2022) allowed participants to accept or reject various debt and saving contracts with an incentivized experiment. They systematically observed that participants consistently preferred saving contracts over debt contracts, even after controlling

for time preferences, risk aversion, and loss aversion. Their structural estimation revealed that a substantial majority (89%) of participants exhibited aversion to being in debt.

Given the substantial influence of domains on time preferences, it is reasonable to consider that the framing of intertemporal choices across different domains may also impact preferences. The framing effect was a well-established phenomenon in economics, psychology, and other disciplines (Tversky & Kahneman, 1981). This effect suggests that decisions are affected by how choices are presented, even when the final consequences of the options remain unchanged.

Loewenstein (1988) highlighted that the way intertemporal options are presented as either speeding up or delaying outcomes influences choices significantly. For instance, individuals who anticipated receiving a VCR in a year were willing to pay an average of $54 to get it right away, whereas those expecting it immediately required an average of $126 to agree to a one-year delay. Additionally, the strength of framing effects can even reverse the sign effect, showing that individuals are more inclined to discount future outcomes by merely changing the frames of the intertemporal choices decisions, e.g., an acceleration frame in which the default is to realize the outcomes in the future and a delayed frame in which the default is to realize the outcomes today (Appelt et al., 2011; Benzion et al., 1989; Shelley, 1993, 1994; Yamamoto et al., 2020).

Framing choices as multiple events has been shown to have an impact on preferences, as demonstrated by Thaler (1985) and Thaler and Johnson (1990). Thaler's study involved framing outcomes as multiple events, and participants were asked to evaluate which frames they considered to be more favorable. For instance, they were presented with a choice between receiving $100 and then paying $80, or receiving $20 as a single outcome. The majority of participants strictly preferred for the single outcome of receiving $20, despite the total outcomes being identical. Thaler and Johnson (1990) showed another evidence that separating outcomes has an impact on preferences. Participants perceived greater happiness when gains were temporally separated,

indicating a preference for receiving multiple gains separately. Linville and Fischer (1991) also found similar results which the subjects preferred to temporally separate two positive events.

This paper specifically focuses on the specific type of framing similar to Thaler (1985), which involves dividing outcomes into multiple components or manipulating the values of various outcomes to highlight common components in choices. In these kinds of situations, individuals have a tendency to disregard shared components when making decisions. This phenomenon, known as *cancellation*, was demonstrated by Kahneman and Tversky (1979). Participants in their study were presented with two choice options following a prior bonus. In the first scenario, participants were given a bonus of 1,000 and subsequently had to choose between Lotteries A and B:

- Lottery A: a 50% chance of winning 1,000, with no win otherwise
- Lottery B: a guaranteed win of 500

In the second scenario, participants received a bonus of 2,000 and then had to choose between Lotteries C and D:

- Lottery C: a 50% chance of a loss of 1,000, with no loss otherwise
- Lottery D: a guaranteed loss of 500

Interestingly, despite equivalent overall outcomes between Lotteries A and C, as well as B and D, the majority favored Lottery B in the first scenario and Lottery C in the second. These results suggest that individuals tend to overlook the common prior bonus and instead focus on the specific outcomes of the lotteries.

Wu (1994) study also observed the occurrence of cancellation in risky decision-making and revealed that participants exhibit a tendency to disregard outcomes that are transparently common in lottery choices. For instance, when given the choice between a risky lotteries, X and Y:

- Lottery X: a 32% chance of winning $3,600, a 1% chance of winning $3,500 and no win otherwise

- Lottery Y: a 32% chance of winning $3,600, a 2% chance of winning $2,000 and no win otherwise

participants overlooked the shared chance of winning $3,600, focusing instead on the distinct outcomes to determine their preferable lottery.

Weber and Kirsner (1997) conducted a similar experiment investigating choices between a safer lottery and a riskier lottery. Each lottery consisted of three outcomes, with one outcome being common between both lotteries. By varying the magnitude of this common outcome, they found no significant impact on the selection of the riskier option, reinforcing the cancellation concept.

Cancellation has been documented in ambiguity choices as well (Schneider et al., 2018). The consistent observation of this phenomenon across different studies and variations in common outcome magnitudes attesting to its durability in decision-making processes.

Given these findings, it is plausible to influence intertemporal decisions by manipulating common outcomes and framing intertemporal choices across various domains. This is due to individuals' tendency to ignore common outcomes, potentially leading to shifts in preferences. Related literature, such as Abraham et al. (2020), found a significant framing effect on choices between income-driven loan repayment plans and standard fixed-amount repayment plans by emphasizing cost aspects of the plans. However, their framing approach differs from ours, which involves presenting outcomes in multiple components. To our knowledge, no previous studies have demonstrated the impacts of investment or loan frames on decisions due to cancellation.

Our novel experiments presented binary intertemporal payment choices framed as investments and loans. Initially, we devised options that offered payments at both sooner and later dates, and then we divide the payments for each option into two components: common payments (CPs), where the payment amounts are common to both choices, and main payments (MPs), where the payment amounts differ between choices. Consequently, each option has two distinct payments at both

sooner and later dates (see Figure 1 for an example question). By varying the CP amounts, we can create different frames without altering total outcomes, effectively transforming the MPs into either investment and loan domains. This led us to hypothesize that CPs are disregarded and decisions are based solely on MPs, thus the Investment frame or Loan frame affects time preferences.

We conducted three online studies in which participants were presented with realistic scenarios requiring them to choose between projects offering different payments at sooner and later dates. In Study 1, we observed distinct differences in individual discount factors (IDFs) between the framed scenarios and a control (No frame) scenario, showing a pronounced framing effect. This finding suggests that participants likely overlooked the common payments (CPs), concentrating instead on the main payments (MPs) when making their decisions.

Study 2 showed that the observed framing effect was both substantial and consistent. Study 2 delved deeper into the extent of this effect, revealing that even significantly larger CPs—sufficient to change the total outcome's domain—seemed to be disregarded by participants.

Study 3, based on the experimental design of Study 1, introduced incentives for the decision-making process, also demonstrated a significant framing effect from the Loan frame, akin to Study 1's findings. Moreover, the comparison of IDFs between Study 1 and Study 3 revealed no significant differences, affirming the reliability of decisions made in the hypothetical scenarios.

Study 1: Influence of Investment and Loan Frames on Intertemporal Choices

Our first study was designed to test how Investment and Loan frames affect time preferences in Gain and Loss sections. In these scenarios, total outcomes are positive for the Gain section and negative for the Loss section. We will also confirm whether individuals ignore common payments (CPs) when making these decisions.

Method

Participants. In Study 1, we recruited 300 participants for our experiment through the online platform Prolific (39% female, mean age = 40 years, age range: 18-73 years, nationality: UK). Our target was collecting around 100 participants each for three treatments: No frame, Investment frame and Loan frame. The study took an average of 7 minutes and 18 seconds to complete and participants received a fixed compensation of £1.

Design and procedure. The participants were randomly assigned to one of three framing treatments, each sharing identical total outcomes. Each participant went through two sections, Gain section and Loss section. Participants were presented with hypothetical scenarios involving a choice between two project sets, AC and BC, which included taking on Projects A and C or Projects B and C, respectively. Set AC and BC are assumed to be equally difficult and take an equal amount of time to complete. The projects could be successful or unsuccessful, meaning that they directly get the profits or suffer losses from the projects. The payments for the projects will be made today and in 2 months. After they read the scenario, participants were presented with the specific payments of the projects at the moment of making intertemporal choices. Note that both sets include Project C, hence the payments from Project C are the CPs. The parameters in the first question that the participants saw for each frame are shown in Table 1 (See Figure 1 for an example of the actual question that the participants saw).

Insert Table 1 about here.

Insert Figure 1 about here.

The payments in the study are denoted as (M_0, M_2), where M_0 represents an immediate payment and M_2 denotes a payment realized in 2 months. In the No frame, the CPs were set to £8 today and £8 in 2 months, thus expressed as (8, 8). Positive values of *M* describe the amount of payment subjects receive, while negative values of *M* indicate the amount of payments subjects lose. They

chose between Set AC, with payments of (16,16) plus the CPs (8, 8), and Set BC, with payments of (X, 24) plus the CPs (8, 8). The value of X (varying from £0.1 to £16 in the No frame) started at 8 and varies based on the previous choices to identify indifference points where the options appeared equally attractive. This method followed the modified Parameter Estimation by Sequential Testing (PEST) algorithm (Findlay, 1978; Walters et al., 2016): (1) The initial step size is 4; (2) The step size was reduced each time the direction of change was reversed; (3) the step size remained the same otherwise; (4) terminate the procedure when the step size becomes less than 1. The advantage of the PEST procedure is that the early choices do not constrain the range of possible indifference points, as is the case with other titration methods.

In the Investment frame, the total outcomes mirrored those of the No frame, but the CPs were manipulated to (32, 8) to reflect an investment context. This configuration resulted in MPs being negative today and positive in 2 months. In the Loan frame, the CPs were set to (8, 48) to align MPs with a loan context, resulting in MPs being positive today and negative in 2 months.

The Loss section was a reverse mirror of the Gain section, with all parameter signs reversed. For example, in the No frame for the Loss section, choices were between Set AC, with (-16, -16) plus the CPs (-8, -8), and Set BC, comprising (X, -24) plus the CPs (-8, -8). Notice that the MPs in the Investment and Loan frames remain consistent between the Gain and Loss sections to be comparable. The order of the section was randomized.

To make sure that the participants understand the scenario, they need to pass the comprehension question about the instructions before making the intertemporal choices. As most of the previous papers investigating time preferences of losses (e.g., Abdellaoui et al., 2018), we utilized hypothetical scenarios due to ethical and logistical concerns associated with subjects experiencing financial losses at different times. The issue of incentivizing decisions is revisited in Study 3. Detailed experimental instructions are available in the Online Appendix.

Exclusion criteria

We will exclude two types of extreme responses from our analysis. The first type of extreme case is when participants consistently choose Project A, even when Project B (weakly) dominates A. For instance, in the Gain section under the No frame treatment, a participant might choose Set BC, which yields £24 today and £32 in two months, over Set AC, which provides £24 today and £24 in two months. Such choices violate the principle of monotonicity, a fundamental property of preference theory, leading to the exclusion of these participants.[1] The other type of extreme case is that participants always choose Set BC. In that case, they would see, for example, Set AC (receive £24 today and £24 in 2 months) and Set BC (receive £8.1 today and £32 in 2 months in Gain section in No frame treatment, thus the sooner date of project B is £0.1 in this option).[2] Although there is no theoretical reason to exclude the observations that participants choosing Set BC in the example above, such choices indicate that the value in the sooner date of Project B (remember, Set BC consists of project B and C) must be negative to make Set AC and BC indifferent. But now this frame of the question would be no longer the same anymore (Investment frame in this example). Therefore, we will exclude observations choosing B in the extreme question above. Anyway, such preferences infer the extreme monthly individual discount factor (IDF) of more than 1.40, indicating that they chose extremely patient options. Similarly, in the Loss section, exclusion criteria are based on violations of monotonicity and the exhibition of extreme IDFs that fall outside the intended frames.

[1]There was an additional question in which Set BC (receiving £24.1 today and £32 in two months) unambiguously dominates Set AC (receiving £24 today and £24 in two months). Participants who select Set BC in this question will be considered in our supplementary analysis (refer to Appendix B).

[2] According to the rule of the modified PEST, it should be £0. However, we show £0.1 instead only in this special case to keep all the payments positive.

Debt Aversion Measure (DAM) scale

After the intertemporal choices, the participants answered the Debt Aversion Measure (DAM; Schleich et al., 2021) consisting of seven questions on a 6-point scale to measure the level of debt aversion. The questions include, for example, "If I have debts, I like to pay them as soon as possible" (*1 = very much like me to 6 = not at all like me*). We then created the variable *DAM* describing the average score of the questions. This measure could potentially correlate with the variations in decisions between the Loan and Investment frames. Walters et al. (2016) showed that individuals with higher levels of debt aversion, as measured by the *DAM*, exhibited a more pronounced saving-borrowing asymmetry. At the end of the experiment, they answered the questions about their demographics, including age, gender and education.

Results and discussion

The demographic variables including age, gender and education across the treatments are not statistically different, indicating the randomization properly works in this study (Table 2). We report our analyses in this section, excluding the observations by following the rules above.[3] However, we replicate the analyses including the observations which weakly violated monotonicity in Appendix B. The overall results do not change indicating our results are robust.

Insert Table 2 about here.

Figure 2 presents the boxplot of monthly individual discount factors (IDFs) for each treatment. The IDFs are calculated from the indifference points derived using the elicitation method outlined in the preceding section. We employ the assumption of an additive utility function and a standard linear model in intertemporal decisions to estimate them. For example, if the indifference value of X is 12 in the No frame in the Gain section, the participant is indifferent between receiving £24

[3] We have 6.33% of the observations that violate monotonicity and 1.33% of the observations that exhibit extreme discounting in the Gain section and have 1.33% of the observations that violate monotonicity and 8% of the observations that exhibit extreme discounting in the Loss section.

today and £24 in 2 months and receiving £20 today and £32 in 2 months ($24 + \delta^2 24 = 20 + \delta^2 32$). Therefore, the monthly IDF (δ) is about 0.71 with the assumptions above. Lower IDFs are interpreted as indicative of less patience.

In Figure 2, the IDFs appear to be lower in the No frame than the other frames in the Gain section, suggesting that frames affect the decisions. Due to the non-normal distribution of IDFs (Shapiro-Wilk test for each frame: $p < .001$), we employed non-parametric tests. The IDF in No frame significantly differed from that in the Investment frame (Mann-Whitney U test; $p = .02$) and the Loan frame ($p < .001$). In the Loss section, the IDF was appeared to be higher in the No frame than in the other domains in the graph, suggesting the framing effect in the opposite direction compared to the Gain section. Indeed, the IDF in the No frame was different from that in the Investment frame ($p < .01$) and the Loan frame ($p = .04$). These findings support our hypothesis that framing influences time preferences in both sections.

Insert Figure 2 about here.

In addition, the IDF in the Loan frame significantly differed from that in the Investment frame in the Gain section (Mann-Whitney test; $p < .01$), aligning with the concept of saving-borrowing asymmetry. However, the difference was not significant in the Loss section ($p = .54$).

Debt aversion, as measured by the Debt Aversion Measure (DAM),[4] was investigated by Walters et al. (2016) and found to be more pronounced in individuals with higher levels of debt aversion. Our regression analysis, including only observations from the Investment and Loan frames in the Gain section, introduced a *Loan* dummy variable (1 for Loan frame, 0 otherwise). The regression of IDFs against DAM, *Loan*, and their interaction term revealed that the interaction term was not significant, diverging from Walters et al. (2016)'s findings.

[4] The mean score of the DAM in this study was 33.1, with 86.7% of participants reporting debt aversion above the midpoint of the scale, echoing results of the previous studies.

Next, we compare the IDFs between the Gain and Loss sections. In the No frame, median IDFs are higher in the Loss section (Wilcoxon signed-rank test; $p < .001$) aligning with the sign effect. In contrast, in both the Investment and Loan frames, the IDFs were not significantly different ($p = .07$; $p = .11$). These outcomes in the two frames support the cancellation hypothesis: despite constant MPs, the varying CPs did not significantly affect decisions, indicating that participants focused on the MPs and disregarded the CPs in their decision-making process.

Nonetheless, the variation was not limited to the CPs; the total outcomes between the Gain and Loss sections also differed. Therefore, decisions were influenced by both CPs and total outcomes, potentially counterbalancing each other, cannot be entirely ruled out. However, this scenario seems unlikely given the observed differences in IDFs between the No frame and the other frames in both sections, despite identical total outcomes.

Study 2: Investigating the Boundary Condition of Common Payments Ignorance

We have thus far observed that time preferences are influenced by the Investment or Loan frames. This framing effect seems to arise from participants overlooking common payments between options.

Study 1 tested only one specific CP for each treatment in each section. Furthermore, the CPs were not large enough to change the domain of the total outcomes; total outcomes for all questions in the No, Investment and Loan frames in the Gain section fell within the gain domain, and those in the Loss section were within the loss domain. Different values of CPs or total outcomes might significantly influence decisions. Higher values of CPs increase their relative importance, particularly if they are large enough to shift the domain of the total outcomes, making it less likely for the CPs to be ignored.

In Study 2, we use various CPs for each treatment while keeping the MPs constant (thus, the total outcomes are no longer identical between main treatments) in the main treatments. The highest

absolute values of CPs in this study were £32 today and £76 in 2 months, higher than in Study 1, and some CPs were large enough to alter the domain of total outcomes.

Therefore, the aim of this study is to explore the framing effect's boundary conditions by manipulating CPs. The cancellation hypothesis posits that preferences should remain consistent as long as the MPs are identical. Conversely, if the domains of total outcomes or the magnitude of CPs influence decisions, we should observe variations in the IDFs in such scenarios.[5]

Method

Participants. We recruited 800 participants for our experiment via Prolific (48% female, mean age = 43 years, age range: 18-84 years, nationality: UK). The study took an average of 6 minutes and 4 seconds to complete and participants received a fixed fee of £0.8.

Design and procedure. This study replicated the scenario from Study 1, but exclusively focused on the Gain section, so no Loss section in this study. Participants were randomly assigned to one of eight treatments, with the initial parameters for each detailed in Table 3.

Insert Table 3 about here.

Six main treatments

Six main treatments featured identical MPs: (16, 20) for Project A and (8, 28) for Project B. The experiment encompassed three domains of total outcomes: gain, investment and loan. Each domain within the main treatments had two distinct CPs. Specifically:

- In the gain domain, *gain_no* had no CP, whereas *gain_CP* included a CP of (-6, -10).
- In the investment domain, *inv_CP* presented a CP of (-32, 16), and *inv_CPD* offered a doubled CP of (-64, 36).

[5] In Study 2, we also fixed the locations of options for MPs. In the main treatments, the left option is always (16,20) and the right option is always (8, 28) in the first questions.

- In the loan domain, *loan_CP* involved a CP of (16, -32), with *loan_CPD* providing a doubled CP of (32, -76).

According to the cancellation hypothesis, the IDFs for all main treatments should be identical. However, should the domain of the total outcome exert an influence on decision-making, the IDFs across varying domains of total outcomes are expected to differ. For example, use *gain_no* as a baseline, the CP in *loan_CP* is sufficiently large to alter its domain from that of gain. Consequently, if the domain of the total outcome impacts decisions, differences in IDFs between these two conditions may be observed.

Furthermore, analyses within the same domain, such as *inv_CP* and *inv_CPD*, which both fall under the investment domain, are conducted to assess whether larger CPs have a discernible effect on decision-making choices.

Two additional treatments

The remaining two domains were included to examine the effect of total outcomes. The *inv_CPD'* treatment, representing a specific frame of *inv_CPD*, shares the same total outcome as *inv_CPD* but without CPs. Similarly, *loan_CPD'*, a specific frame of *loan_CPD* presents identical total outcomes as *loan_CPD* but without CPs.

Following the intertemporal decision-making tasks, participants completed the Debt Aversion Measure (DAM) and demographic questions including age, gender and education, as in Study 1.

Results and discussion.

The demographic variables including age, gender and education across the treatments are not statistically different, indicating the randomization properly works in this study (Table 4). We applied the same exclusion criteria as in Study 1.[6]

Insert Table 4 about here.

Figure 3 displays the boxplot of IDFs for each treatment, which aligns with the cancellation hypothesis. The IDFs of the six main treatments with different CPs did not show significant differences (Kruskal-Wallis test; $p = .59$). This outcome supports the cancellation hypothesis and suggests that participants primarily focused on the MPs while making decisions, overlooking the CPs.

We will examine a possibility that preferences are influenced by both CPs and total outcomes, with these effects potentially neutralizing each other, although this is unlikely, as discussed in Study 1. To assess the impact of total outcomes, we analyzed two additional treatments.

The IDFs between *inv_CPD* and *gain_no* (treatments with identical MPs) were not significantly different (Mann-Whitney test; $p = 0.13$). However, substituting *inv_CPD* with *inv_CPD'* and retesting these treatments showed that the IDFs between *inv_CPD'* and *gain_no* (treatments with different MPs) were significantly different ($p < .001$). Similarly, the IDFs between *loan_CPD* and *gain_no* (treatments with identical MPs) showed no significant difference ($p = .56$), while the IDFs between *loan_CPD'* and *gain_no* (treatments with different MPs) differ significantly ($p < .001$). The findings further suggest the participants' primary focus on MPs rather than total outcomes.

Insert Figure 3 about here.

[6] We excluded 5.38% of the observations for violating monotonicity and 1.63% for extreme discounting. In Appendix B, we replicate the analysis including the observations which weakly violated monotonicity as in Study 1. The overall results remain unchanged, indicating the robustness of our findings.

In addition, the IDFs between *inv_no* and *loan_no* are different (p = .02). This is in line with the borrowing-saving asymmetry. We conducted the similar regression analysis to see the relationship between the borrowing-saving asymmetry and DAM as in Study 1, but our findings are again different from the results of Walters et al. (2016).[7]

Study 3: Incentivizing Choices in the Gain Section

The aforementioned studies consistently demonstrate that framing exerts significant influences on individual time preferences. However, it is important to note that the decisions examined in these studies were not incentivized. While certain prior research papers have reported no disparity in discount factors between real and hypothetical rewards (Johnson & Bickel, 2002; Madden et al., 2003), others have raised concerns regarding the hypothetical bias in intertemporal decisions. Frederick et al. (2002) argued that uncertainty exists as to whether individuals, when presented with hypothetical rewards, are sufficiently motivated or capable of accurately predicting their actions if the outcomes were real. Furthermore, Kirby and Maraković (1995) discovered that individuals exhibited higher IDFs when the rewards were hypothetical.

Thus, we decided to incentivize the decisions only in the Gain section of Study 1 to examine the framing effect under such conditions. Incentivizing the Gain section is feasible because the overall payment of the section is positive. However, we decided not to incentivize the Loss section of Study 1 due to some serious problems. Letting participants lose money in the future is ethically challenging since participants must be compensated after participating in experiments. To circumvent this issue, we could provide endowments or allow participants to earn some money to cover the losses by completing tasks. However, that procedure also has significant flaws. If

[7] The mean score of the DAM was 32.5, with 83.7% of participants reporting debt aversion above the midpoint of the scale. To conduct the analysis, we only used the observations of treatments *inv_no* and *loan_no*. The dummy variable *loan_no* takes a value of 1 if the observations are in *loan_no* and 0, otherwise. We regress IDFs on DAM, *loan_no* and the interaction term of these two variables. The interaction term was not significant.

participants receive additional rewards not derived from the intertemporal questions, the rewards can be considered as another common payment. Since we cannot differentiate these additional rewards from CPs in our analysis, we decided to incentivize only the Gain section of Study 1.

Method

Participants. We recruited 300 participants for our experiment via Prolific (52% female, mean age = 44 years, age range: 18-81 years, nationality: UK). The study took an average of 7 minutes and 32 seconds to complete.

Design and procedure. This study mirrored the Gain section from Study 1, with the key distinction being the incentivization of intertemporal payment decisions. One in ten participants was randomly chosen for actual payment at the study's conclusion.

After the intertemporal decisions, we asked the demographic questions similar to that in Studies 1 and 2. Additionally, we included exploratory questions that are potentially correlated with intertemporal decisions according to the previous studies. These questions include household income, McArthur scales of subjective social status (Adler et al., 2000) and DAM (Schleich et al., 2021).

For the participants selected for actual payment, the amounts were directly tied to the choices they made during the experiment, and any show-up fees were not provided to them. One option was randomly selected for payment on its scheduled date, with immediate payments issued on the experiment day and deferred payments exactly two months from the experiment day. Those not selected for actual payment received a show-up fee of £0.8.

Results and discussion

The demographic variables including age, gender, education, income and McArthur scales, examined across the treatments showed no significant differences for these four factors, with

income being the sole exception. This outcome indicates that the randomization process was mostly effective, as evidenced by the consistency in the four variables (Table 5).[8]

Insert Table 5 about here.

Figure 4 displays a boxplot of monthly IDFs for each treatment. Consistent with Study 1, we found significant differences between the Loan frame and No frame (Mann-Whitney test; $p = .02$). However, no significant difference was observed between the No frame and Investment frame ($p = .37$). In addition, the IDF in the Loan frame was not significantly different from that in the Investment frame (Mann-Whitney test; $p = .13$).

Insert Figure 4 about here.

We compared the results with those from the Gain section in Study 1. The IDFs between these studies are not statistically different (Mann-Whitney test; No frame, $p = .56$; Investment frame, $p = .43$; Loan frame, $p = .08$), indicating that the results from incentivized and non-incentivized experiments are not different. Repeating the regression analysis on the DAM from Study 1, our findings were consistent with those of Study 1 and did not reveal a stronger saving-borrowing asymmetry among individuals with higher DAM.

We also analyzed the data based on participants' income levels, categorized observations by the median income level: those earning at or above the median were classified into the higher income group, while those earning below the median were placed in the lower income group. Notably, a significant impact of the Loan frame was observed among lower-income participants (Mann-Whitney test; $p = .03$), whereas such an effect was absent among higher income participants ($p = .2$).

[8] We excluded 10% of the observations that violate monotonicity and 4.67% of the observations that exhibit extreme discounting by following the same rules used in the previous Studies 1 and 2. In Appendix B, we replicate the analysis including the observations which weakly violated monotonicity as in Study 1. The overall results remain unchanged, indicating the robustness of our findings.

The results clearly demonstrate that the impact of the Loan frame on intertemporal decisions in the incentivized experiment and corroborate the findings from Study 1's Gain section, enhancing the credibility of results from non-incentivized studies.

General discussion

Our series of three experiments investigated the impact of Investment and Loan frames on time preferences, uniquely demonstrating that common payments (CPs) tend to be disregarded in intertemporal decisions.

In Study 1, we manipulated the presentation of monetary outcomes by dividing the payments into CPs, which are identical between the option, and main payments (MPs), which payments amounts differ between the options. This manipulation allowed the MPs to represent an investment domain or a loan domain, termed the Investment frame and the Loan frame, respectively. Notably, individual discount factors (IDFs) differed between these frames and a control treatment (No frame), illustrating a significant framing effect. Furthermore, the results suggest that participants tended to disregard the CPs, focusing primarily on the MPs in their decision-making.

Study 2 further examined the robustness and strength of the framing effect, demonstrating that even large CPs, sufficient to change the domain of the total outcome, were generally disregarded.

Study 3 introduced incentives for intertemporal payment decisions, yet the significant framing effect from the Loan frame persisted, aligning with Study 1's findings. Moreover, IDFs for overall decisions did not differ from those in Study 1, suggesting that the results of non-incentivized experiments were reliable.

Notably, in the incentivized experiment, no difference in IDFs was observed between the No frame and Investment frame, which diverges from the findings of Study 1. The cause of this discrepancy is not immediately apparent, but it does not seem to be attributable to the incentivization, as the IDFs did not vary significantly between the Studies 1 and 3. This raises the

possibility that the lack of observable effect in the Investment frame may be due to a Type II error, despite our relatively large sample size of 300, which was maintained consistently across Studies 1 and 3.

There might be an alternative explanation for the framing effect other than the cancellation hypothesis. Both positive and negative payments were presented in the Investment and Loan frames. Furthermore, these frames included a mix of positive and negative payments for both sooner and later dates, differentiating them from the No frame treatment, which exclusively displayed either positive or negative payments. An auxiliary experiment, as detailed in Appendix A, shows that exposure to a combination of positive and negative payments does not significantly impact decision-making.

Our results were different from the unpublished work of Walters et al. (2016), who suggested that borrowing-saving asymmetry is driven by individuals more averse to debt, as measured by the Debt Aversion Measure (DAM). This difference could be due to our use of a single question and a between-subjects design, as opposed to Walters et al.'s multiple-question, within-subjects approach.

Implications

Our findings have practical implications, showing that time preferences can be influenced without changing total outcomes. This insight is applicable across various fields. In the stock market, for instance, the framing effect might lead investors to prefer certain stocks over others, despite identical total outcomes. Stocks typically generate profit through dividends and price increases. Our results imply that, despite identical total returns from different stocks, investors may exhibit preferences. To illustrate, consider two hypothetical stocks: Stocks A and B. Both yield identical dividends, whereas their prices fluctuate over time. The dividends in this scenario are akin to CPs, and the price changes resemble MPs in our experimental framework. By adjusting the common dividend values without changing the total outcomes, Stocks A and B can mimic

Investment or Loan frames as in our experiments. Our findings suggest that these frames significantly influence investor preferences, as they tend to overlook the common dividend components and focus instead on fluctuations in stock prices. Nevertheless, this illustration does not account for the inherent uncertainty of stock prices, thus incorporating uncertain elements into our experimental design will be a potential future extension of our research.

Likewise, the framing effect could influence user preferences between opting for free accounts or upgrading to premium memberships on platforms like Freelancer.com, a prominent freelancing and crowdsourcing marketplace. This type of platform requires an upfront payment for premium memberships that later offer additional benefits, resembling the structure of our Investment frame. Even though overall advantages for premium and free members might be similar, users may show a preference for one over the other.

Our findings are also relevant to experiments where participants receive participation fees in advance and then make financial decisions. A potential concern is that participants might factor in these fees when making decisions. This is particularly problematic in experiments that incentivize decisions about losses. In such cases, integrating the participation fee into the decision-making process effectively transforms a decision about a loss into one about a gain. However, our results indicate that participants tend to make their decisions without considering these upfront fees.

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Appendix A: Displaying a Combination of Positive and Negative Payments in the No Frame Treatment

The observed framing effect in our studies appears to stem from the cancellation of common payments in intertemporal questions, although alternative explanations may be viable. Notably, in the Investment and Loan frames, each question displayed both positive and negative payments. Moreover, these frames presented a mix of positive and negative payments for both sooner and later dates, which contrasts with the No frame treatment, where only positive or negative payments were shown. This exposure to a combination of positive and negative payments could influence decision-making, a phenomenon potentially described as the *mixed-outcome effect*.

First, the introduction of losses can provoke emotional reactions that impact decision-making processes. Individuals are typically loss-averse, meaning losses are perceived as more significant than equivalent gains (Kahneman & Tversky, 1979; Tversky & Kahneman, 1991). This loss aversion is often driven by negative emotions such as fear or anxiety (Camerer, 2005). Furthermore, people tend to disproportionately react to minor losses (Loewenstein et al., 2001).

Second, making decisions in the Investment and Loan frames could be more cognitively demanding than in the No frame if participants aim for rational choices. To ascertain the overall outcomes, participants in the No frame need to perform basic calculations: simple addition for the No frame (simple subtraction in the *gain_CP* treatment in Study 2), versus both addition and subtraction in the other frames to calculate the total amounts of sooner and later payments.

Thus, the framing effect found in our studies could be attributed to the simultaneous presence of positive and negative payments at both sooner and later dates in the Investment and Loan frames. This effect may be due to negative emotions or cognitive burdens associated with mixed outcomes. This hypothesis, termed the mixed-outcome effect, is investigated in this auxiliary experiment.

Method

Participants. We recruited 500 participants for our experiment via Prolific (44% female, mean age = 40 years, age range: 18-77 years, nationality: UK). The study took an average of 7 minutes and 21 seconds to complete and participants received a fixed fee of £1.

Design and procedure.

This study utilized the same scenario as Study 1, with each participant going through Gain and Loss sections. However, unlike Study 1, This study comprises five treatments, all of which are No frame treatments. This means that MPs in sooner and later dates are consistently positive in the Gain section and negative in the Loss section. The five treatments include four main treatments and one additional treatment. The four main treatments were designed to test the mixed-outcome effects; hence, the values of the MPs are fixed, but the sign of the CPs in sooner and later dates is manipulated to create either non-mixed or mixed outcomes. In non-mixed-outcome scenarios, each question displayed only positive or negative payments, while in mixed-outcome scenarios, a combination of positive and negative payments was shown. The distinction between these treatments lies not only in the presence or absence of mixed payments but also in the total outcomes. Therefore, the additional treatment was introduced to determine whether participants' decisions were influenced by the total outcomes despite previous results from Studies 1 and 2 suggesting that total outcomes are unlikely to be a significant factor. The parameters of each treatment in the first question are detailed in Table A1.

Insert Table A1 about here.

Four main treatments and an additional treatment

The four main treatments in the Gain section presented the same MPs: (32, 32) for Project A and (16, 48) for Project B in the first question. The sooner payment of the Project A varies in subsequent questions to find indifference values, using the same method as in Studies 1, 2 and 3.

Each treatment featured distinct CPs. The treatments named *No CP* and *Base* represent non-mixed-outcome scenarios, while *Mixed 1* and *Mixed 2* correspond to mixed-outcome scenarios. Specifically:

- No CP treatment (non-mixed-outcome) has no CPs, represented as (0,0).
- Base treatment (non-mixed-outcome) includes CPs of (12, 12).
- Mixed 1 treatment (mixed-outcome) includes CPs of (-12, 12).
- Mixed 2 treatment (mixed-outcome) includes CPs of (12, -12)

An additional treatment, named *Base'*, representing a specific frame of *Base*, shares the same total outcome as *Base* but without CPs. In the Loss section, the sign of all payments for each option is inverted (see Table A1).

The mixed-outcome effect hypothesis posits that preferences between *Base* and *Mixed 1*, as well as between *Base* and *Mixed 2*, should differ. Conversely, the cancellation hypothesis predicts that preferences across all main treatments should be identical. Additionally, to ascertain if the total outcomes influence preferences, we examine differences between *Base'* and *No CP*. Following the intertemporal questions, participants completed the same demographic questions as in Study 1.

Results and discussion.

The demographic variables including age, gender and education across the treatments are not statistically different, indicating the randomization properly works in this study (Table A2).[9]

Insert Table A2 about here.

[9] We excluded 2.4% of the observations for violating monotonicity and 1.8% for exhibiting extreme discounting in the Gain section, as well as 2.4% of the observation for violating monotonicity and 6.4% for exhibiting extreme discounting in the Loss section, applying the same criteria as in our earlier studies. In Appendix B, we replicate the analysis including the observations that weakly violated monotonicity, consistent with the approach in Study 1. The overall results remain unchanged, indicating the robustness of our findings.

Figure A1 presents a boxplot of the monthly discount factors for each treatment. The results support the cancellation hypothesis and do not endorse the mixed-outcome effect hypothesis. The IDFs did not significantly differ between the *Base* and *Mixed 1* treatments, nor between *Base* and *Mixed 2* in the Gain section (Mann-Whitney test; $p = .62$ and $p = .48$, respectively). The IDFs between *Base* and *No CP* were not significantly different either ($p = .77$).

Subsequently, further analysis was conducted to examine the effect of total outcomes as mentioned in the Method section. We showed that the IDFs between *Base* and *No CP* (treatments with identical MPs) were not significantly different in the above analysis. However, replacing *Base* with *Base'* and retesting these treatments revealed a significant difference between *Base'* and *No CP* (treatments with different MPs) ($p < .01$). The result further illustrates the participants predominantly focused on MPs rather than total outcomes.

Similar findings were observed in the Loss section. The IDFs between the three pairs (*Base* vs. *Mixed 1*, *Base* vs. *Mixed 2*, and *Base* vs. *No CP*) showed no significant differences ($p = .91$; $p = .88$; $p = .78$, respectively), not supporting the mixed-outcome effect hypothesis either. However, the difference in IDFs between *Base'* and *No CP* was not statistically significant ($p = .57$), suggesting that the difference of MPs between the two does not impact decisions in the Loss section. We maintained the same absolute numbers between the Gain and Loss sections for comparability. However, the magnitude of difference in MPs between *Base'* and *No CP* in the Loss section might not be substantial enough to yield statistically significant results. Adjusting these values potentially reveal significant differences. Furthermore, the time spent on decision-making between these treatments showed no significant difference (Kruskal-Wallis test; $p = .47$), indicating that presenting mixed outcomes does not necessarily complicate the decision-making process.

Insert Figure A1 about here.

Appendix B: Robustness check

In our main analysis, we omitted observations that either weakly or strictly violated the principle of monotonicity across all studies, aligning with conventional methodologies for assessing individual preferences. However, for this robustness check, we have included observations that weakly violate monotonicity and have replicated the main analysis regarding IDFs. Table B1 illustrates the proportion of observations that weakly violate monotonicity in each study. The subsequent analysis demonstrates that the inclusion of these observations does not alter the overall results, thereby affirming the robustness of the findings reported in the main analysis.

Insert Table B1 about here.

Study 1

In line with the main analysis, framing effects were observed in both the Gain and Loss sections in Study 1. Specifically, the IDF in the No frame was statistically distinct from that in the Investment frame (Mann-Whitney test; $p < .01$) and the Loan frame ($p < .001$). In the Loss section, significant differences were found between the IDF in the No frame and those in the Investment frame ($p = .01$) and the Loan frame ($p = .04$).

The comparative analysis of IDFs between the Gain and Loss sections is consistent with the results of the main analysis. In the No frame, median IDFs were higher in the Loss section (Wilcoxon signed-rank test; $p < .001$), whereas in the Investment and Loan frames, the IDFs did not significantly differ ($p = .07$; $p = .12$).

Study 2

The overall findings from Study 2 are consistent with those of the main analysis as well and further confirm that the framing effect was substantial and robust. First, the outcomes support the cancellation hypothesis, as no significant differences were observed in the IDFs across the six main treatments (Kruskal-Wallis test; $p = .64$). The subsequence analysis further suggests that

participants focused on MPs rather than total outcomes in their decisions. Specifically, no significant difference was observed in the IDFs between *loan_CPD* and *gain_no* ($p = .63$), while a significant difference was found between *loan_CPD'* and *gain_no* (Mann-Whitney test; $p < .001$). Similarly, there was no significant difference in IDFs between *inv_CPD* and *gain_no* ($p = .17$), while a significant difference was found between *inv_CPD'* and *gain_no* (Mann-Whitney test; $p < .01$).

Study 3

The findings from Study 3 also align with those of the main analysis, demonstrating that the IDF in the Loan frame is significantly different from that in the No frame ($p < .01$). Additionally, there was no significant difference between the IDF in the No frame and that in the Investment frame (sign-rank test; $p = .22$).

Subsequently, we compared the results with those from the Gain section in Study 1. The IDFs between these studies are not statistically different in the No frame and Investment frame (Mann-Whitney test; No frame, $p = .80$; Investment frame, $p = .21$), consistent with the main analysis. However, the IDFs between the two studies are significantly different in the Loan frame ($p = .04$). While this specific result differs from the main analysis, it does not detract from the overall pattern of results, which affirm the replicability and stability of the framing effects identified in our research.

Auxiliary Study

The findings from Auxiliary study align with those of the main analysis confirming the cancellation hypothesis. Our replication test does not support the mixed-outcome effect hypothesis. The IDFs between the Base condition and the other three main conditions (*Mixed 1*, *Mixed 2* and *No CP*) showed no significant differences ($p = .54$, .28 and .77, respectively) in the Gain section. Similarly, IDFs between *Base* and the other three main conditions were not significant ($p = .91$, .88

and .78, respectively) in the Loss section. Subsequent analysis on the effect of total outcomes is consistent with the main analysis as well. The IDF was significantly different between the Base' and No CP treatments in the Gain section ($p < .01$) but not in the Loss section ($p = .57$).

Table 1

Parameters in the First Questions for each Treatment in Gain and Loss Sections (Study 1)

Section	Name	CP	MP Project A or Project B	Total outcome
Gain	No frame	(8,8)	(16,16) or (8,24)	(24,24) or (16,32)
Gain	Investment	(32,8)	(-8,16) or (-16,24)	(24,24) or (16,32)
Gain	Loan	(8,48)	(16,-24) or (8,-16)	(24,24) or (16,32)
Loss	No frame	(-8,-8)	(-16,-16) or (-8,-24)	(-24,-24) or (-16,-32)
Loss	Investment	(-8,-48)	(-16,24) or (-8,16)	(-24,-24) or (-16,-32)
Loss	Loan	(-32,-8)	(8,-16) or (16,-24)	(-24,-24) or (-16,-32)

Notes: The payments in the experiments are denoted as (M_0, M_2), where M_0 represents an immediate payment and M_2 signifies a payment realized in 2 months. After the first question, the sooner payment of Project B is varied for each question based on the previous answers while the other payments remain fixed to identify their indifference points.

Table 2

The Summary Table of Demographic Variables (Study 1)

Variables	No Investment		Loan				F	p
	Mean	SD	Mean	SD	Mean	SD		
Age	38.67	(12.75)	40.47	(13.78)	40.67	(12.94)	.71	.49
Female	0.61	(0.49)	0.56	(0.50)	0.65	(0.48)	.86	.43
College	0.51	(0.50)	0.62	(0.49)	0.55	(0.50)	1.19	.31
DAM	33.08	(6.98)	33.54	(7.49)	32.75	(7.64)	.29	.75
N	102		99		99			

Notes: The dummy variable *College* is assigned a value of 1 for subjects holding a college degree and 0 for those without. The variable *DAM* represents the total scores from the Debt Aversion Measure, which includes seven questions on a 6-point scale to assess the level of debt aversion.

Table 3

Parameters in the First Questions for each Treatment (Study 2)

Name	CP	MP Project A or Project B	Total outcome	Domain of total outcome
gain_no	(0,0)	(16,20) or (8,28)	(16,20) or (8,28)	Gain
gain_CP	(-6,-10)	(16,20) or (8,28)	(10,10) or (2,18)	Gain
inv_CP	(-32,16)	(16,20) or (8,28)	(-16,36) or (-24,44)	Investment
inv_CPD	(-64,36)	(16,20) or (8,28)	(-48,56) or (-56,64)	Investment
inv_CPD'	(0,0)	(-48,56) or (-56,64)	(-48,56) or (-56,64)	Investment
loan_CP	(16,-32)	(16,20) or (8,28)	(32,-12) or (24,-4)	Loan
loan_CPD	(32,-76)	(16,20) or (8,28)	(48,-56) or (40,-48)	Loan
loan_CPD'	(0,0)	(48,-56) or (40,-48)	(48,-56) or (40,-48)	Loan

Notes: The payments in the experiments are denoted as (M_0, M_2), where M_0 represents an immediate payment and M_2 signifies a payment realized in 2 months. After the first question, the sooner payment of Project A is varied for each question based on the previous answers while the other payments remain fixed to identify their indifference points.

Table 4

The Summary Table of Demographic Variables (Study 2)

Variables	gain_no Mean (SD)	gain_CP Mean (SD)	inv_no Mean (SD)	inv_CP Mean (SD)	inv_CPD Mean (SD)	loan_no Mean (SD)	loan_CP Mean (SD)	loan_CPD Mean (SD)	ANOVA F (p)
Age	43.80	45.49	41.83	40.20	41.96	44.97	41.49	42.63	1.61
	(13.57)	(14.62)	(14.96)	(14.20)	(13.93)	(14.02)	(13.31)	(14.70)	(.13)
Female	0.56	0.56	0.52	0.51	0.53	0.47	0.48	0.50	0.5
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(.84)
College	0.13	0.14	0.13	0.17	0.12	0.20	0.16	0.12	0.72
	(0.33)	(0.35)	(0.34)	(0.38)	(0.33)	(0.40)	(0.37)	(0.32)	(.65)
DAM	32.91	30.59	32.49	32.55	32.41	32.26	32.60	33.12	0.8
	(8.16)	(9.52)	(8.30)	(7.70)	(8.62)	(8.60)	(7.56)	(6.53)	(.59)
N	87	87	104	105	105	103	105	104	

Notes: The dummy variable *College* is assigned a value of 1 for subjects holding a college degree and 0 for those without. The variable *DAM* represents the total scores from the Debt Aversion Measure, which includes seven questions on a 6-point scale to assess the level of debt aversion.

Table 5

The Summary Table of Demographic Variables (Study 3)

Variables	No Investment		Loan				F	p
	Mean	SD	Mean	SD	Mean	SD		
Age	45.42	(13.73)	45.05	(14.85)	43.05	(14.79)	0.71	.49
Female	0.56	(0.50)	0.50	(0.50)	0.43	(0.50)	1.63	.2
College	0.51	(0.50)	0.52	(0.50)	0.57	(0.50)	0.35	.71
Income (£)	53653.85	(32472.77)	49400.00	(25655.84)	42926.83	(24819.74)	3.35	.04
McArthur	5.44	(1.58)	5.19	(1.46)	5.14	(1.61)	1.1	.34
DAM	31.83	(9.01)	31.89	(7.30)	31.96	(7.83)	0.1	.99
N	109		107		84			

Notes: The dummy variable *College* is assigned a value of 1 for subjects holding a college degree and 0 for those without. The variable *Income* represents the annual gross income in GBP. The variable *McArthur* describes the average scores from the McArthur scales of subjective social status. The variable *DAM* represents the total scores from the Debt Aversion Measure, which includes seven questions on a 6-point scale to assess the level of debt aversion.

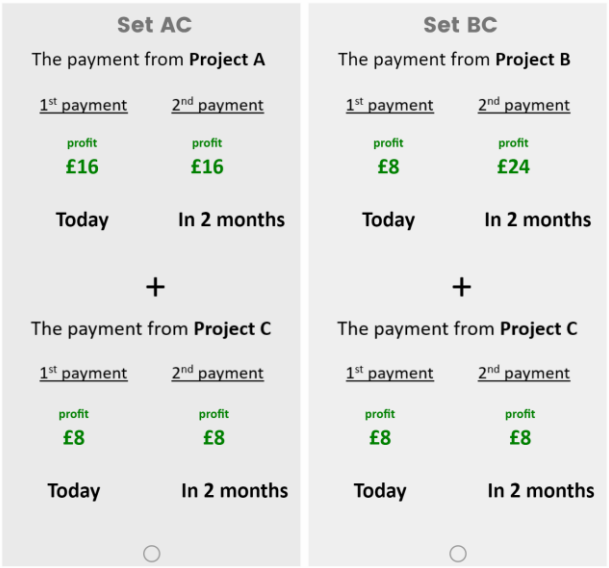

Figure 1. The Screenshot of the Question (No frame, Gain section; Study 1).

The payments from Project C in the question are common payments (CPs) because they are identical for both options. The remaining payments in the questions are main payments (MPs).

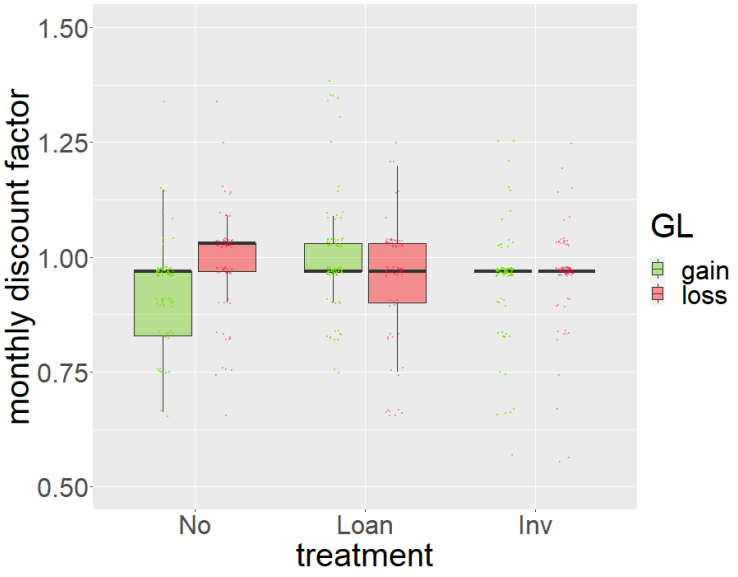

Figure 2. The Monthly Discount Factors across Treatments in Gain and Loss Sections (Study 1).

Each dot represents one observation. The bold horizontal line inside each box is the median; the bottom and top of the box are the first and third quartile, respectively.

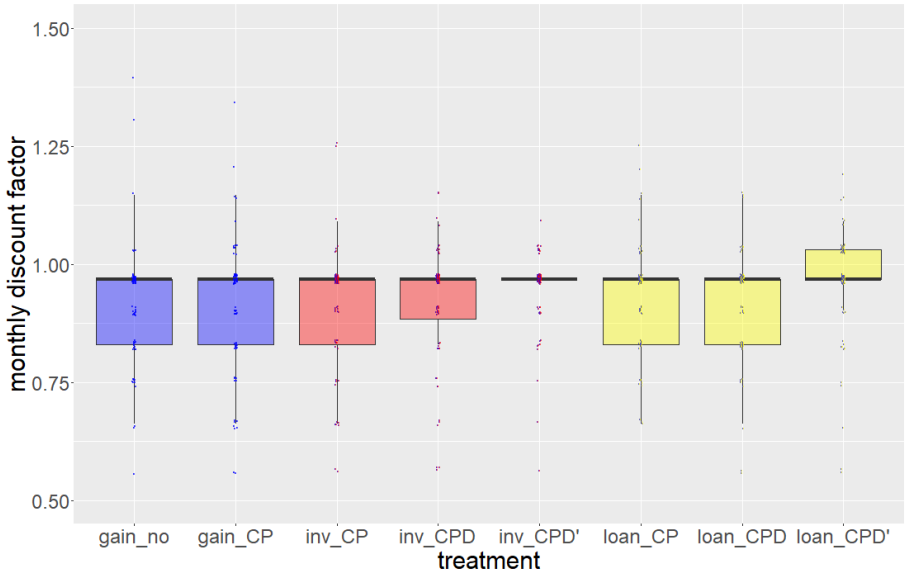

Figure 3. The Monthly Discount Factors across Treatments (Study 2).

Each dot represents one observation. The bold horizontal line inside each box is the median; the bottom and top of the box are the first and third quartile, respectively.

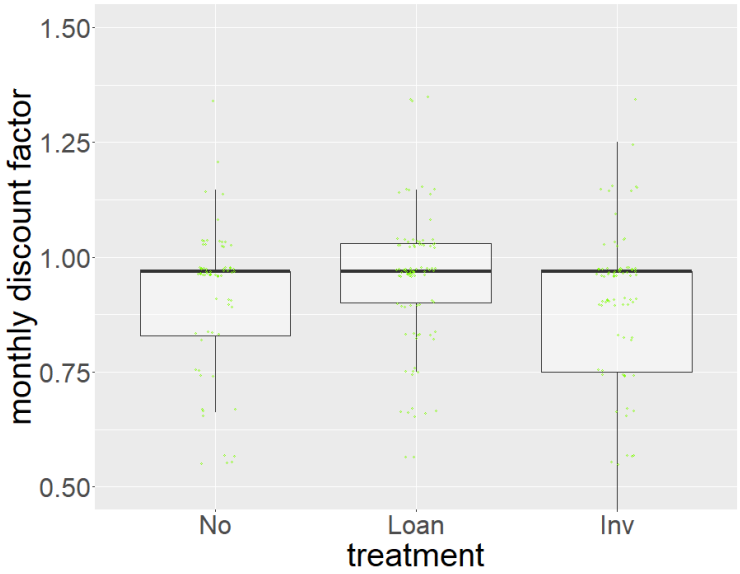

Figure 4. The Monthly Discount Factors across the Treatments (Study 3).

Each dot represents one observation. The bold horizontal line inside each box is the median; the bottom and top of the box are the first and third quartile, respectively.

Table A1

Parameters in the First Questions for each Treatment in Gain and Loss Sections (Auxiliary Study)

Section	Name	CP	MP Project A or Project B	Total outcome
Gain	No CP	(0,0)	(32,32) or (16,48)	(32,32) or (16,48)
Gain	Base	(12,12)	(32,32) or (16,48)	(44,44) or (28,60)
Gain	Mixed 1	(-12,12)	(32,32) or (16,48)	(20,44) or (4,60)
Gain	Mixed 2	(12,-12)	(32,32) or (16,48)	(44,20) or (28,36)
Gain	Base'	(0,0)	(44,44) or (28,60)	(44,44) or (28,60)
Loss	No CP	(0,0)	(-32,-32) or (-16,-48)	(-32,-32) or (-16,-48)
Loss	Base	(-12,-12)	(-32,-32) or (-16,-48)	(-44,-44) or (-28,-60)
Loss	Mixed 1	(12,-12)	(-32,-32) or (-16,-48)	(-20,-44) or (-4,-60)
Loss	Mixed 2	(-12,12)	(-32,-32) or (-16,-48)	(-44,-20) or (-28,-36)
Loss	Base'	(0,0)	(-44,-44) or (-28,-60)	(-44,-44) or (-28,-60)

Notes: The payments in the experiments are denoted as (M_0, M_2), where M_0 represents an immediate payment and M_2 signifies a payment realized in 2 months. After the first question, the sooner payment of Project A is varied for each question based on the previous answers while the other payments remain fixed to identify their indifference points.

Table A2

The Summary Table of Demographic Variables (Auxiliary Study)

Variables	**No CP** **Mean** **(SD)**	**Base** **Mean** **(SD)**	**Mixed 1** **Mean** **(SD)**	**Mixed 2** **Mean** **(SD)**	**Addition** **Mean** **(SD)**	**ANOVA** **F** **(p)**
Age	39.68	41.00	39.92	38.50	38.73	0.57
	(14.68)	(13.10)	(12.63)	(13.08)	(13.08)	(.68)
Female	0.56	0.49	0.56	0.55	0.59	0.52
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(.72)
College	0.22	0.22	0.21	0.25	0.18	0.33
	(0.42)	(0.41)	(0.41)	(0.43)	(0.39)	(.86)
N	98	102	100	101	99	

Notes: The dummy variable *College* is assigned a value of 1 for subjects holding a college degree and 0 for those without.

Table B1

The Proportion of the Observations that Weakly Violate Monotonicity

	Gain	**Loss**
Study 1	3.33%	0.67%
Study 2	3.25%	-
Study 3	3.67%	-
Auxiliary	0.8%	1.8%

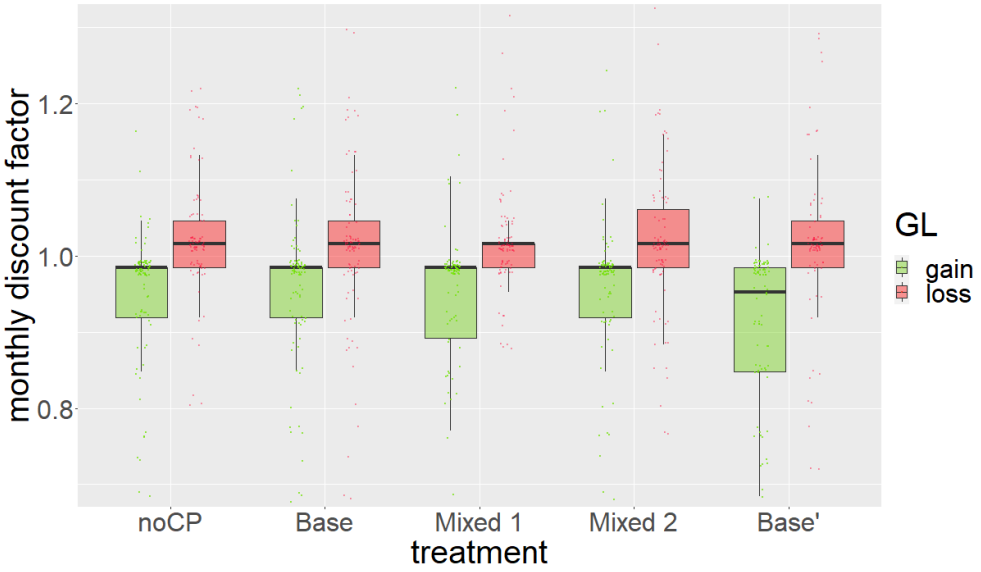

Figure A1. The Monthly Discount Factors across Treatments in Gain and Loss Sections (Auxiliary Study).

Each dot represents one observation. The bold horizontal line inside each box is the median; the bottom and top of the box are the first and third quartile, respectively.