

**Cross-Period Impatience:
Subjective Financial Periods Explain Time-Inconsistent Choices**

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ABSTRACT

Inconsistency in consumer time preferences has been well-established and used to explain seemingly short-sighted behaviors (e.g., failures of self-control). However, prior research has conflated time-inconsistent preferences (discount rates that vary over time) with present bias (greater discounting when outcomes are delayed specifically from the present, as opposed to from a future time). This research shows that time-inconsistent preferences are reliably observed only when choices are substantially delayed (e.g., months into the future), which cannot be explained by present bias. This seeming puzzle is explained by a novel cross-period discounting framework: Consumers are more impatient when choosing between options occurring in different subjective financial periods. As a result, they display inconsistent time preferences and are less willing to wait for an equally delayed outcome specifically when a common delay to both options moves the larger-later option into a subsequent financial period. Six studies and supplementary studies demonstrate the insufficiency of current models of time discounting, and that sensitivity to subjective financial periods both predicts and causes specific inconsistency in intertemporal preferences.

Keywords: intertemporal choice, time discounting, categorization, mental accounting, budgeting, impulsivity, present bias

Trade-offs between sooner and later benefits are fundamental to consumer decision-making. For example, by foregoing consumption now and spending less, a consumer can afford more consumption in the future. Consumers' time preferences, the degree to which they are willing to forgo smaller-sooner rewards for larger-later rewards, have been used to predict a wide array of consumer financial decisions including spending or saving (Bartels and Urminsky 2015), educational investment (Yoon, Yang and Morewedge 2021), mortgage repayment (Atlas, Johnson and Payne 2017), and retirement decisions (Bidewell, Griffin and Hesketh 2006).

Consumer time preferences have been characterized in terms of two distinct aspects: their *discount rate*, the degree to which consumers value earlier outcomes more than later outcomes in general, and their *present bias*, the degree to which they value outcomes more that are specifically in the present (see Frederick, Loewenstein and O'Donoghue 2002; Urminsky and Zauberman 2015 for reviews).

The normative exponential discounting model assumes that consumers have stable time preferences, defined only by a constant discount rate, resulting in consistent preferences between options separated by a given delay, regardless of when the delay begins (Samuelson 1937). However, descriptive research has challenged this assumption, documenting evidence of hyperbolic discounting, such that people value options with short delays less than would be predicted by the normative model, relative to options with longer delays (Ainslie 1975; Thaler 1981). Present bias explains this deviation from normative choices as an additional devaluation of options when they are delayed from the *present*, over and above exponential discounting based on the length of the delay (Laibson 1997).

The construct of present bias has been widely applied as an explanation of consumer behaviors that involve seeming short-run impatience, including higher food consumption at the

beginning of the month among food stamps recipients (Shapiro 2005), paying for costly monthly memberships instead of a cheaper annual membership (DellaVigna and Malmendier 2006), failure to stick to debt-repayment plans (Kuchler and Pagel 2021) and consumer “lock-in” (i.e., consumers sticking to the first-considered option and failing to search further, Zauberman 2003). Measures of present bias have been found to predict various apparently short-sighted consumer decisions, such as failure to save (Bernheim, Skinner and Weinberg 2001), credit card borrowing (Meier and Sprenger 2010), and energy consumption (Werthschulte and Löschel 2021).

Prior theories have assumed that present-biased consumers tend to give in to impulsivity when faced with the possibility of an immediately available “present” option (Hoch and Loewenstein 1991). However, despite widespread reliance on the present bias construct, prior work on intertemporal choice has not precisely defined the “present” that consumers treat differently and has not empirically identified it. Recent research (Hershfield and Maglio 2020) has confirmed that most people see the present as short (e.g., commonly the current day or shorter), and finds a relationship between the length of the present and general future-minded preferences, but do not investigate present bias. Research adopting the assumption that the duration treated as the present is as brief as the current day (or briefer), has found quite mixed results when directly testing for present bias over this interval (Scholten and Read 2010).

We propose and test a novel and falsifiable account of time-inconsistent preferences, based on consumers’ own subjective mental categorization of specifically financial periods (Heath and Soll 1996; Henderson and Peterson 1992; Sussman and O’Brien 2016). In our *cross-period discounting* framework, consumers are more impatient specifically when choosing between two options that each occur in *different* subjective financial periods (e.g., compared to equivalent choices between options that both occur within the *same* subjective financial period),

or in other words, exhibit *cross-period impatience*. We test our account in six pre-registered studies (N=3,500).

THEORETICAL BACKGROUND

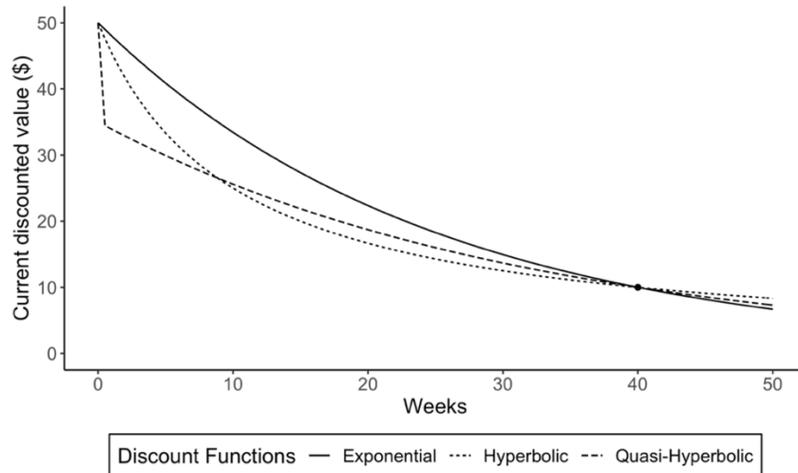
Time Discounting, Time Inconsistency, and Present Bias

Positive financial outcomes that occur further in the future are objectively less valuable (e.g., due to opportunity costs, such as foregone interest earned). The normative exponential model predicts that the loss of value for an outcome due to a given delay should be the same regardless of when the delay occurs (Samuelson 1937). In this view, a person choosing whether to select a larger-later reward over a smaller-sooner one simply assesses whether the extra reward amount constitutes sufficient compensation, relative to the person's personal interest rate, for the additional delay.

Descriptive research has instead found that people exhibit diminishing impatience, such that delayed outcomes lose less value per unit of time the longer the delay (Ainslie 1975; Loewenstein and Prelec 1992; Thaler 1981). Present bias describes the tendency to more strongly favor a sooner over later option the earlier the sooner option occurs and has been operationalized as “a bias for the ‘present’ over the ‘future’” (O’Donoghue and Rabin 1999). In this view, outcomes in the present are especially valued, and therefore greater value is lost when delayed from the present than from other times. The present bias construct has been used as an explanation of self-control failure, such that temptations in the present are over-valued relative to

the delayed consequences, resulting in impulsive behaviors (Ainslie 1975; Hoch and Loewenstein 1991).

FIGURE 1
DISCOUNT FUNCTIONS



NOTE. The curves display discount functions for an individual who is indifferent between \$50 in 40 weeks and \$10 today.

The degree to which an outcome loses value due to a delay of length t can be expressed as a discount factor, $f(t)$, which is multiplied by the non-delayed value to compute the net present value of the delayed option (see Urminsky and Zauberman 2015 for a review). Early researchers proposed replacing the exponential discount factor, $f(t) = \delta^t$, with an entirely different, *hyperbolic* function, $f(t) = 1/(1+kt)$, based on prior descriptive research in animal behavior (Ainslie 1975; Mazur 1987). While highly influential in psychology, this approach confounds present bias with discount rates and cannot capture the possibility of normative exponential discounting. As a result, some researchers instead use the *quasi-hyperbolic* discounting model (Laibson 1997),

which can be defined as $f(t) = \beta\delta^t$ when $t > 0$ and $f(0) = 1$ when $t = 0$ (i.e., in the present), to accommodate present bias. In this model, the parameter $\beta < 1$ captures the degree of present bias (i.e., the degree of departure from exponential discounting). Figure 1 illustrates the difference in the present value of \$50 in t weeks, depending on the assumed model.

Measuring Present Bias

Present bias, and departures from exponential discounting in general, have most commonly been tested by comparing how much consumers discount options over shorter vs. longer delays (Thaler 1981). For instance, by comparing how much more money a person requires to forego an immediate reward (e.g., \$100 now) to receive the money either after a shorter delay (e.g., two weeks) or after a longer delay (e.g., one year), researchers can calculate the implied discount rate over the different lengths of time. If the shorter-term discount rate is higher than the longer-term discount rate, preferences will be better approximated by the hyperbolic (or quasi-hyperbolic) discounting model than the exponential discounting model (Kirby 1997; Kirby and Maraković 1996; Myerson and Green 1995). While a better model fit is often interpreted as evidence for present bias, this indirect approach confounds present bias with the length of delay between the rewards (Read 2001).

A more direct test of present bias specifically, as opposed to time inconsistency in general, is to compare people's choices between a smaller present option and a larger delayed option with their choices in another scenario, in which a "common delay" has been added to both options (i.e., making it a choice between a relatively less delayed and more delayed option). For example, present-biased consumers would be more likely to choose the smaller-sooner option

when facing a choice between \$100 now or \$110 in 4 weeks, than they would when instead choosing between \$100 in 26 weeks or \$110 in 30 weeks (i.e., both options moved forward by a “common delay” of 26 weeks; Keren and Roelofsma 1995). This test of the *common delay effect* has found evidence for present bias in multiple studies (Coller and Williams 1999; Green, Fristoe and Myerson 1994; Keren and Roelofsma 1995; Kirby and Herrnstein 1995).

The common delay test also reveals an unresolved question in the existing models—how long must the common delay be before present bias is transcended and people’s choices become more patient? Some theories suggest that present bias involves non-linear gradual change over time in psychological factors, such as subjective perceptions of time (Zauberman et al. 2009) and connectedness to the future self (Bartels and Rips 2010). These theories imply a gradual decline in present bias, potentially consistent with hyperbolic discounting, instead of a clear distinction between present and future.

Other theories, however, have argued that present bias is due to unique psychological properties of the current moment, including certainty of immediate outcomes (Keren and Roelofsma 1995) and greater affective temptation for immediate rewards (Loewenstein 1996; Metcalfe and Mischel 1999). Neuroscience researchers have proposed that the present (e.g., in terms of seconds, for immediately consumable rewards) involves a different brain system than rewards delayed even by minutes (McClure et al. 2007; but also see Kable and Glimcher 2010 for counterevidence). This stream of research suggests that even brief delays from the present should result in a one-time drop in subjective value for the outcome, a view increasingly adopted in economic theories of present bias (Direr 2020; Harris and Laibson 2013; O’Donoghue and Rabin 2015).

The empirical evidence has not resolved the question of when the “present” period ends. Scholten and Read (2010) report mixed evidence for present bias in the prior literature, with some studies failing to find evidence of the common delay effect. In fact, studies that failed to detect present bias have been interpreted as providing support for normative time-consistent preferences for monetary rewards (Andreoni and Sprenger 2012; Augenblick, Niederle and Sprenger 2015; Holcomb and Nelson 1992). A recent meta-analysis of studies using convex time-budget allocation tasks (Imai, Rutter and Camerer 2021) finds that present bias with monetary rewards is more likely to be observed when the immediate option was to be paid earlier (e.g., by the end of the experiment, as opposed to the end of the day, Balakrishnan, Haushofer and Jakiela 2020).

Most recently, Hershfield and Maglio (2020) directly examined the mental construct of “the present,” that is, when people perceive that the present moment ends and the future begins in general. For the majority of their study participants, the present ended in less than a day, which is consistent with the assumption of some previous tests of present bias (e.g., treating “today” vs. “tomorrow” as in the current vs. future period). However, while they relate the notion of a shorter subjective present to arguably far-sighted behaviors overall, their research did not examine whether people value rewards more when occurring in the subjective present vs. after the present. While these results suggest that the present period may be very brief, other studies have found the common delay effect between choices involving only delayed options (Green et al. 1994; Green, Myerson and Macaux 2005; Scholten and Read 2006), which cannot be explained by present bias, assuming that the empirically measured length of the present period from Hershfield and Maglio (2020) applies to present-biased intertemporal choices.

Mental Accounting and the Categorization of Time

Our account begins from the premise that present bias may be better understood in terms of how consumers mentally account for time. Consumers use categorization to manage their financial activities, organizing their income and expenditures into “mental accounts” (Heath and Soll 1996; Thaler 1999) and proactively using budget categories when making future financial plans (Zhang et al. 2020). Thinking in terms of categories allows consumers to consider a narrower set of aggregate outcomes, reducing the cognitive burden from making decisions (Henderson and Peterson 1992). In a variety of domains, people have been found to narrowly-bracket outcomes, assessing costs and benefits within a temporal category, as opposed to interchangeably across time periods (Camerer et al. 1997; Lambrecht and Tucker 2012; Zhang 2017).

Research on memory has found evidence of spontaneous use of temporal categories, such that people can recall a broader temporal unit to which past events belong even when they fail to precisely recall the exact timing of the event (Huttenlocher, Hedges and Prohaska 1988; Robinson 1986). Consistent with the view that people think categorically about time, financial outcomes that co-occur are more likely to be categorized in the same mental account than events that are temporally distinct (Thaler and Johnson 1990), and conversely, people prefer similar events to be in the same temporal category (Evers, Imas and Kang 2021).

Such categorization can be shaped by salient external markers (e.g., the end of the hour or the month or one’s birthday), with consequences for preferences and decisions (Dai, Milkman and Riis 2014; Donnelly, Compiani and Evers 2021; Peetz and Wilson 2013, 2014; Soster, Monga and Bearden 2010; Tu and Soman 2014). Research on categorization shows that, in

addition to externally defined categories, a category structure can be initially constructed based on salient goals (Barsalou 1983) and then established in memory, remaining stable over time (Barsalou 1995), and influencing consumer decisions (Reinholtz, Bartels and Parker 2015). This suggests that consumers managing their finances may learn what temporal categorization fits their goals, adopting that categorization and reliably applying the categorization to their decisions.

Indeed, survey-based research has found that people differ in their long-term subjective financial planning horizons (between several months to several years), and that longer planning horizons predict a range of “farsighted” financial behaviors (for a review, see Hong and Hanna 2014). However, long-term financial planning (e.g., saving and investment plans over the period of several years) is distinct from shorter-term financial planning (e.g., each month), which focuses on cash-flow and credit management (Hilgert, Hogarth and Beverly 2003), suggesting that different financial management tasks may motivate different financial planning horizons. Lynch et al. (2010) find that some consumers endorse multiple planning horizons, in terms of days, months, and years, with distinct behavioral correlates. They find high test-retest reliability of people’s propensity to plan over different time horizons, suggesting that the planning horizons tend to be “rolling” (i.e., defined by a length of time rather than fixed periods defined by a specific end-date).

Subjective Financial Periods and Cross-Period Discounting

We propose an alternative account of time inconsistency, based on consumers’ mental accounting of outcomes into different time periods, specifically in financial planning (i.e., as

opposed to a general sense of the present, as in Hershfield and Maglio 2020). We start from the baseline assumption that consumers prefer sooner to later outcomes, potentially in line with normative exponential discounting. We posit that individual consumers making intertemporal choices will additionally rely on their own subjective categorization of time into financial periods that they consistently rely on in managing relevant financial affairs (e.g., their cash flow). The novel insight in our account is that time-inconsistent choices can therefore be explained by *cross-period discounting*, an incremental discrete devaluation of outcomes that occur in a later (vs. sooner) financial period, *over and above* any continuous discounting based on delay.

Cross-period discounting implies that consumers will be less willing to wait for an outcome, holding objective delay constant, when it occurs in a later subjective financial period, exhibiting *cross-period impatience*. Contrary to the standard view of time-inconsistent preferences as caused by a present bias defined by immediacy, we propose that inconsistent preferences are instead explained by a present subjective financial period. Specifically, we predict that the common delay effect will be observed when the common delay is long enough for the smaller-sooner outcome to no longer be perceived as in the present financial period.

We first demonstrate that the shift in preference from making a more impatient choice (preferring the smaller-sooner option) to a more patient choice (preferring the larger-later option) is only reliably observed when comparing present-future choices to future-future choices with a sufficiently long common delay (Study 1). These results are not only inconsistent with normative exponential discounting, which assumes time-consistent preferences, but are also inconsistent with the standard behavioral accounts (hyperbolic and quasi-hyperbolic discounting). These

results confirm that while discounting is inconsistent over time, the pattern of inconsistency cannot be simply explained by present bias.

Next, we test for *cross-period impatience*: greater impatience when choosing between two options that occur in different (vs. the same) individual-specific time periods. In Study 2, we measure consumers' categorization of time into current and future financial periods and randomly assign participants to make a cross-period or same-period consequential choice. In Study 3, we measure the degree of cross-period impatience, over and above present bias and stable time preferences. We confirm the predicted cross-period effect and find that it is not explained by subjective length of delays (Zauberman et al. 2009) or anticipated slack (e.g., differences in valuation of money at different times; Zauberman and Lynch 2005).

To test the proposed framework for explaining the effect, we distinguish cross-period impatience from calendar-based categorization effects on time preferences in Study 4. Then, we test cross-period impatience using experimentally manipulated subjective financial periods in budgeting, between a current and future period (Study 5) as well as among different future periods (Study 6).

Details of participant exclusions and stimuli for the main studies are provided in the Web Appendix. Data, study materials, codes for analyses and online supplements including additional details on these studies (Online Supplement A) as well as the results of nine supplementary studies (Online Supplement B) are provided in the OSF repository:

<https://tinyurl.com/crossperiod>. All studies were pre-registered, and any deviations from the pre-registered analysis plans are explained in the online supplement.

STUDY 1: VARYING COMMON DELAYS TO TEST TIME-INCONSISTENT PREFERENCES

We tested for time inconsistency using the common delay effect paradigm (Green et al. 1994; Loewenstein and Prelec 1992). Specifically, in a choice between two monetary rewards, we tested the effect of varying the timing for the smaller-sooner reward, with the larger-later reward always one month later than the smaller-sooner reward, thereby holding the delay between the rewards (“inter-reward delay”) fixed.

If consumers have time-consistent preferences (e.g., exponential discounting), their willingness to wait should be consistent regardless of the common delay. Present-biased preferences would instead imply a steep increase in preferences for the larger-later option when the timing of the smaller-sooner option initially changes from present to future, and either consistent preferences (quasi-hyperbolic) or smaller preference changes (hyperbolic) as the smaller-sooner option is farther in the future. In particular, based on the additional assumption that the present is most commonly defined as a very short time (Hershfield and Maglio 2020; O’Donoghue and Rabin 2015), present bias would imply fewer choices of the larger-later option when the smaller-sooner option is available *today*, compared to when the smaller-sooner option is delayed.

Method

We collected valid data from 1,318 online participants via Amazon Mechanical Turk (MTurk). The sample size, exclusions and analyses were pre-registered for all of the studies (see

Online Supplement A for details of pre-registrations and discussion of any deviations from the pre-registration).

We informed participants that they would be choosing between two monetary rewards that would be received at different times, and that some participants would receive one of the choices they had made, as a bonus. Each participant made a potentially consequential choice between two options, a smaller-sooner reward and a larger-later reward. The smaller-sooner reward was either \$35, \$40, or \$45 (randomly assigned), to be received at the time determined by the randomly assigned common delay, either today (i.e., no common delay; baseline condition), in 2 weeks, or in 1, 3, 6, 9 or 12 months (“delayed” conditions), resulting in a 3 (smaller-sooner reward amount) \times 7 (common delay) between-subjects design. The larger-later reward was \$50 to be received one month later than the smaller-sooner reward.

Participants in the six *delayed* conditions then also made the baseline choice (today vs. 1 month) for exploratory analyses to test robustness to within-participants measurement.

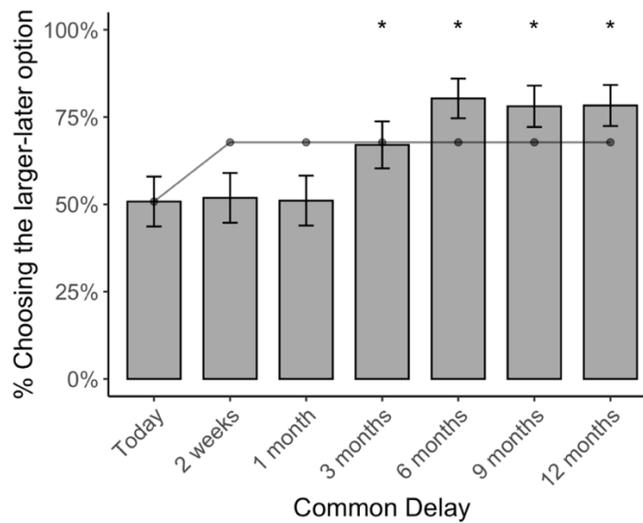
Results

In the baseline condition, when the smaller-sooner option was to be received today, 51% of participants chose the larger-later option (Figure 2). Choices of the larger-later option did not differ significantly from the baseline condition in the two-week (52% choosing the larger-later option, Fisher’s exact test, OR = 1.04, $p = .92$) or one-month common delay condition (51%, OR = 1.01, $p = 1$). Thus, for common delays of one month or less, we fail to find the common delay effect implied by models of time preference involving present bias (e.g., hyperbolic discounting or quasi-hyperbolic discounting).

However, we observed a significant increase in the preference for the larger-later option in conditions with three-month or longer common delays, relative to the baseline condition (3 months: 67%, OR = 1.97, $p = .002$; 6 months: 80%, OR = 3.94, $p < .001$; 9 months: 78%, OR = 3.44, $p < .001$; 12 months: 78%, OR = 3.48, $p < .001$).

FIGURE 2

CHOICE PROPORTIONS BY COMMON DELAY CONDITIONS (STUDY 1)



NOTE. Results are aggregated over smaller-sooner amount conditions. Asterisks indicate statistically significantly different ($p < .05$) choices of the larger-later option from the baseline (“today”) condition (pairwise Fisher’s exact tests). The line shows the best-fit prediction from the quasi-hyperbolic model. Error bars show 95% confidence intervals.

As preferences for the larger-later option became more extreme (i.e., farther from 50%) with longer common delays, these results cannot be explained by reversion to indifference when the common delay is longer (e.g., due to greater errors or weaker preferences, Franco-Watkins,

Pashler and Rickard 2006). In fact, the pattern of results was consistent for both lower and higher magnitudes of the smaller-sooner reward amount (reported in Online Supplement A).

Discussion

Theories of time-inconsistent preferences predict a higher preference for larger-later rewards when the smaller-sooner reward is delayed and not available in the “present.” While the length of the present period has been left unspecified in the quasi-hyperbolic model (Laibson 1997; O’Donoghue and Rabin 1999), most empirical research has assumed the present to be the day of the choice (Ahlbrecht and Weber 1997; Coller and Williams 1999; Green et al. 1994; Read and Roelofsma 2003). This assumption is consistent with recent evidence on individuals’ perception of the present (Hershfield and Maglio 2020) and theories of impulsivity which posit psychological differences when making choices specifically for the here and now (Keren and Roelofsma 1995; Loewenstein 1996; McClure et al. 2007; Metcalfe and Mischel 1999).

In contrast to this prediction, our participants were no more impatient for a smaller-sooner reward today, on average, than when both options were delayed by two weeks or even one month. Based on similar empirical evidence using short common delays, some previous research has concluded that people have time-consistent preferences (0, 7 or 35 day common delays, Andreoni and Sprenger 2012; 0, 1 or 7 days, Holcomb and Nelson 1992; 0 or 60 days, Kable and Glimcher 2010). However, our results contradict time-consistent preferences, as we found a significant common delay effect when participants faced choices that were delayed for three months or longer. Nevertheless, both our results and these prior results are inconsistent with *present* bias, unless the present is defined to extend over a month into the future.

These results suggest that consumers have time-inconsistent preferences that are not well-explained by the constructs of present bias and impulsivity. In the remaining studies, we test the implications of cross-period discounting as evidence of our alternative account of time-inconsistency. This approach can explain how consumers might be both relatively insensitive to short-term common delays and be more patient over longer common delays, as observed in Study 1, based on how consumers subjectively categorize the timing of financial outcomes.

STUDY 2: COMPARING CROSS-PERIOD TO WITHIN-PERIOD DISCOUNTING

Our framework predicts that people will exhibit cross-period impatience, making more impatient choices between a sooner option in the current period and a later option in the future period, compared to an otherwise equivalent choice between options that are both in the same period. To directly test this, we elicited people's boundary between their current and future subjective financial period and randomly assigned them a choice either between two options in their current period, between two options in their future period, or between one option in their current period and one in their future period. We subsequently re-contacted a subset of participants and re-measured their boundary between the current and future financial period.

Method

We collected data from online participants via MTurk. We received 734 valid responses to the current-future financial categorization question, based on which 601 qualified and were assigned to a condition and answered our main dependent variable, constituting our final sample

(as pre-registered). Participants were informed that they would be choosing between two monetary rewards that would be received at different times and that one out of every 100 participants would receive the option they had chosen as a bonus.

To measure the duration of the current financial period, participants read “*When you think about financial matters, such as financial planning or budgeting, how do you think about the current financial period and future financial periods?*” They then classified each of 15 different times (ranging from “today” to “seven months from today,” in two-week increments) into either their current or future financial period. For each participant, we identified the time t_i that was approximately the boundary of the current period for each participant i , such that t_i was still in the current period but t_i+2 weeks was in the future period.

Participants were randomly assigned to one of three between-subject conditions, which determined the focal intertemporal choice the participant was asked to make: current-period (both options in their current financial period), cross-period (one option in their current and the other in their future period), or future-period (both options in their future period). Each choice was between \$45 at an initial time and \$50 two weeks later. A customized common delay was added, such that in the current-period condition, the initial time was t_i-2 , in the cross-period condition the initial time was the t_i , and in the future period condition, the initial time was t_i+2 .

For example, if a participant indicated that “2 weeks from today” was in their current period but “1 month from today” was already in their future period, their choice would be between \$45 today and \$50 in two weeks if assigned to the current period condition, between \$45 in two weeks and \$50 in one month in the cross-period condition, or between \$45 in one month and \$50 in one month and two weeks in the future period condition.

For exploratory analyses, all participants also made the same baseline intertemporal choice (\$45 today vs. \$50 in two weeks) and answered whether each of the options in their focal intertemporal choice were in their current or future financial period.

Results

Subjective Financial Periods. Among the 734 valid survey responses, the median length of the subjective current financial period was a month, with a majority (64%) indicating that their current period extended longer than a month (see online supplement for details). Only 16% of participants indicated that the current period containing today would end before two weeks. The subjective financial period we measure is therefore distinct from both the more general notion of the “present” identified in prior literature as brief (e.g., a “present” that ends in less than one week for 76% of people, and in less than a day for 56%; Study 1 of Hershfield and Maglio 2020) as well as from consumers’ long-term financial planning horizon (e.g., over a year for 70% of people, Dow and Jin 2013).

As pre-registered, only the responses from participants that identified a boundary to the current period such that we could generate the questions in any of the conditions were included in the final sample of 601 (excluding 16% of the participants who indicated that two weeks was already in their future financial period and 2% that indicated the last time tested, 7 months later, was still in the current period).

Choices. In the current period condition, where both options to be received were in the current period, 60% of participants chose the larger-later option (Figure 3). In the cross-period

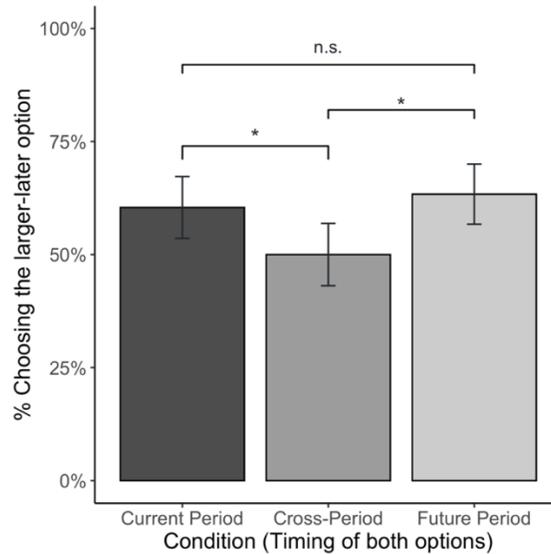
condition, where both options were delayed such that the sooner option was still in the current period but the later option was in the future period, 50% of participants chose the larger-later option, which was significantly lower than in the current period condition (Fisher's exact test, $OR = 0.66, p = .044$). This difference was observed despite participants in the cross-period condition choosing between options with generally longer common delays than those in the current period condition (median common delay in current period condition: one month; median in the cross-period condition: one month and two weeks). This result is consistent with cross-period impatience but contradicts present bias and the common delay effect (i.e., greater patience with a common delay).

In the future period condition, where both options were further delayed such that both options were in the participants' future period (median common delay: two months), 63% chose the larger-later option. Even though both options were more delayed in the future condition than in the current condition, there was no significant difference ($OR = 1.13, p = .61$), contrary to the common delay effect and existing theories of present bias. Importantly, consistent with our prediction, participants were more impatient in the cross-period condition than the future period condition ($OR = 1.73, p = .009$).

We confirmed the overall effect of randomly assigned cross-period choice options in a secondary analysis using linear regression (i.e., a linear probability model, Heckman and Snyder 1997) on choice of the larger-later option ($B_{\text{CrossPeriod}} = -0.13, SE = 0.042, p = .002$), even when controlling for present bias (i.e., whether the smaller-sooner option was in the present; $B_{\text{Present}} = -0.15, SE = 0.082, p = .074$) and the length of the common delay ($B_{\text{CommonDelay}} = 0.067, SE = 0.015, p < .001$).

FIGURE 3

CROSS-PERIOD VS. SAME PERIOD CHOICES (STUDY 2)



NOTE. Asterisks indicate statistically significantly different ($p < .05$) choices of the larger-later option from the cross-period condition (pairwise Fisher's exact tests). Error bars show 95% confidence intervals.

Fixed vs. Rolling Subjective Financial Period. We also tested whether subjective financial periods were more consistent with a *fixed* categorization based on external cues (e.g., salient calendar dates, such as end of month) or a *rolling* definition of the category (e.g., a constant duration, such that the end date changes over time, consistent with goal-based categorization). We re-contacted 200 participants exactly two weeks later, randomly selected from those who had reported valid current periods of at least two weeks in the main survey, and 134 valid follow-up surveys were collected.

Test-retest reliability of the length of the current financial period was fairly high ($r = .57$, $t(132) = 8.017$, $p < .001$), suggesting a stable categorization of time. We found much stronger

evidence for rolling categories than for fixed categories: 37% reported the same length of financial period two weeks later vs. 13% reported a two-week shorter period two weeks later ($\chi^2(1) = 13.43, p < .001$). In fact, directionally fewer people reported a two-week shorter period (consistent with a fixed period categorization) than a two-week longer period (16%), suggesting that even the 13% estimate of people with fixed periods is likely to be over-stated.

Discussion

This study provides a direct test of, and strong evidence for, cross-period discounting. The results are clearly incompatible with exponential discounting, which would predict no differences across conditions, as the inter-reward delay was held constant at two weeks. The results are also incompatible with the current understanding of quasi-hyperbolic discounting, in which the present is defined to be short, as our tests were based on financial periods of two weeks or more (and with the majority of participants reporting financial periods of over one month). Furthermore, the results contradict hyperbolic discounting, which would predict greater patience in the cross-period condition than the current period condition (due to the longer common-delay, on average), the opposite of what we found. Instead, the results suggest that people's idiosyncratic categorization of time leads them to prefer options that do not extend beyond their own current financial period, all else equal.

Many participants (63%) reported different lengths of the current period in the two waves of the survey (about half of which were within two weeks). One possibility is that the differences reflect measurement error. Another possibility is that the financial period is not strictly rolling and the length of the period is adjusted by the person over time. To the degree that the length of

the period does meaningfully vary, this could reflect changes in major structural factors over time (e.g., new upcoming expenses or deadlines causing a revision of the period length).

Alternatively, this could be because the current financial period is constructed based on salient cues in the decision context. In supplementary studies (Studies S6a-b, available in the online supplement), a standard salience manipulation failed to meaningfully shift the planning period, inconsistent with the constructed-period interpretation.

STUDY 3: INDIVIDUAL DIFFERENCES IN CATEGORIZING FINANCIAL PERIODS

In Study 2, different participants had been assigned to different choice options, based on their personal definition of the current financial period. In Study 3, we leveraged heterogeneity across people in their financial periods to test for cross-period impatience, holding constant the set of choice options, by asking participants the same set of intertemporal choices. We elicited each person's subjective financial periods and classified each choice for each person as involving same-period or cross-period options. We tested whether people were more impatient when a choice involved options they viewed as in different periods, and whether that explained what would otherwise be interpreted as evidence of present bias. In addition, we tested two alternative explanations of time-inconsistent preferences from the prior literature: non-linear perception of time (Zauberman et al. 2009) and time-dependent utility (Sharma, Tully and Wang 2019; Zauberman and Lynch 2005).

Method

We collected 285 valid participants from MTurk (data-collection and exclusions pre-registered). Participants made 30 hypothetical intertemporal choices, between \$10 sooner and \$20 later, in randomized order. The delays associated with each option were constructed by crossing six versions of the timing for the \$10 payment (common delay: now, one week, one month, six months, one year, or five years), and five versions of the additional time until the \$20 payment (inter-reward delay: one week, one month, six months, one year, or five years). For example, when the common delay was one month and the inter-reward delay was six months, participants chose between \$10 in one month and \$20 in seven months. After making their choices (unlike in Study 2), participants classified each of the six common delay times as either in the current or future financial period.

Participants completed additional measures intended to account for two alternative ways in which subjective views of time may influence time discounting. Zauberman et al. (2009) found that subjective perceptions of time duration are non-linear, such that the same difference in timing appears to be smaller further in the future than when closer in time, which can explain hyperbolic discounting. To measure participants' subjective perception of future times, we asked them to indicate how long each of the "common delay" times felt relative to "today" (i.e., for one week, one month, six months, one year and five years), on an unnumbered slider labeled "very short" on the left and "very long" on the right.

Another alternative explanation for present-biased preferences is that people evaluate the usefulness or utility of money to be higher in the current financial period than in the future, because of specific needs identified in the present (Sharma et al. 2019; Strotz 1955) or a general

belief that resources will be less constrained in the future (Zauberman and Lynch 2005). To measure time-dependent utility of money, participants were asked “Suppose that you received \$__ today. At what time would this money be most useful to you?” and chose from the six common delay times, separately for both \$10 and \$20.

Results

Cross-Period Impatience. The median of the longest time considered to be in the current financial period was one month, chosen by 58% of the participants who provided a valid categorization. Only 11% of the participants indicated that their current period ended in less than one week. After coding each question as presenting a same-period or cross-period choice to the participant, based on that participants’ own definition of the current vs. future period, about 40% of choices were cross-period for the median participant.

We first applied the test for present bias used in the prior literature. Participants were, on average, more patient when both options were delayed (controlling for inter-reward delay), compared to when the smaller-sooner option was “now” ($B_{\text{Present}} = -0.06$, $SE = 0.011$, $p < .001$; Model 1 in Table 1), which has been interpreted as evidence of present bias.

Next, we tested for cross-period impatience. Consistent with Study 2, participants were less likely to choose the larger-later option when the two options spanned different financial periods ($B_{\text{CrossPeriod}} = -0.19$, $SE = 0.009$, $p < .001$), controlling for inter-reward delay and present bias (Table 1, Model 2). In fact, once we account for this cross-period effect, the test of present bias is no longer significant ($B_{\text{Present}} = 0.0016$, $SE = 0.011$, $p = .88$), suggesting that the seeming evidence of present bias in Model 1 was in fact confounded with and actually explained by the

cross-period effect. These results are robust to also controlling for the length of the common delay (Model 3 in Table 1).

Robustness to Alternative Accounts. Consistent with previous research (Takahashi 2005; Zauberman et al. 2009), perceived duration of time was non-linear and more contracted for longer durations, as indicated by a significant quadratic effect of actual time on perceived length of time ($B_{\text{CommonDelay_Squared}} = -0.11$, $SE = 0.0009$, $p < .001$; see Online Supplement A). Consistent with Zauberman et al. (2009), subjective length of common delay negatively predicted patient choices, suggesting that people who see the same delay as longer are less patient ($B_{\text{Subjective CommonDelay}} = -0.066$, $SE = 0.024$, $p = .007$; Model 4 in Table 1). However, the significant cross-period effect still held ($B_{\text{CrossPeriod}} = -0.17$, $SE = 0.01$, $p < .001$) controlling for subjective time, suggesting that subjective time perception does not explain cross-period impatience.

TABLE 1

TEST OF CROSS-PERIOD IMPATIENCE (STUDY 3)

| Variable | Model 1 | Model 2 | Model 3 | Model 4 |
|-----------------------------|------------------|------------------|------------------|------------------|
| (Intercept) | 0.69 (0.015)*** | 0.74 (0.016)*** | 0.71 (0.016)*** | 0.73 (0.018)*** |
| Present | -0.06 (0.011)*** | 0.0016 (0.011) | 0.016 (0.011) | 0.00092 (0.012) |
| CrossPeriod | | -0.19 (0.009)*** | -0.16 (0.009)*** | -0.17 (0.01)*** |
| CommonDelay (in years) | | | 0.018 (0.003)*** | 0.026 (0.004)*** |
| Subjective CommonDelay | | | | -0.066 (0.024)** |
| InterrewardDelay (in years) | -0.12 (0.002)*** | -0.11 (0.002)*** | -0.11 (0.002)*** | -0.11 (0.002)*** |
| Log Likelihood | -4058 | -3835 | -3809 | -3806 |
| BIC | 8161 | 7724 | 7682 | 7684 |

NOTE. Linear regression on the choice of the larger later option (1: larger-later option is chosen; 0: smaller-sooner option is chosen) with participant-level random intercepts to account for repeated measures; 30 choices per participant. Significance tests are conducted with R ‘lmerTest’ package. Standard errors are in parentheses. *: $p < .05$, **: $p < .01$, ***: $p < .001$

To test for time-dependent utility of money, for each question about the most useful time for \$10 and \$20, we coded whether participants rated the amount of money as having higher utility today (0), more utility after today (1), and averaged these two measures. We replicated both the cross-period effect and the lack of a present-bias effect ($B_{\text{CrossPeriod}} = -0.16$, $SE = 0.009$, $p < .001$; $B_{\text{Present}} = 0.016$, $SE = 0.011$, $p = 0.14$) controlling for relative future utility, which did not predict choices ($B_{\text{FutureUtility}} = 0.062$, $SE = 0.038$, $p = 0.1$; see Online Supplement A).

Lastly, the cross-period effect was robust to controlling for the length of the subjective current period for each participant ($B_{\text{CrossPeriod}} = -0.16$, $SE = 0.009$, $p < .001$; $B_{\text{Present}} = 0.016$, $SE = 0.011$, $p = 0.14$), although a longer subjective current period also predicted greater patience ($B_{\text{LengthOfCurrentPeriod}} = 0.004$, $SE = 0.001$, $p = .004$). This result suggests the cross-period effect was not due to an overall higher impatience (i.e., across all choice options) among those with a shorter current period. Instead, consistent with our account, having a different length of the current period predicts greater patience for some choices (those that would be in the same period for the person) but greater impatience for other choices (those that would be in different periods), as shown in Study 2.

Discussion

We find that subjective financial periods, via identification of cross-period choice options, better explains time inconsistency in participants' choices than does present bias, even controlling for the length of the common delay. These findings are not explained by non-linear subjective perceptions of time or differences in perceived utility of money over time. In an additional pre-registered study (Study S2, Online Supplement B), we replicated the cross-period

effect using a different set of intertemporal choices and a more fine-grained elicitation of the length of the current financial period. As in Study 3, the significant evidence of present bias is eliminated when accounting for the highly significant cross-period effect, even controlling for the length of common delay.

STUDY 4: DURATION VS. DATES AND SPONTANEOUS VS. PRESENTATION-DEPENDENT CATEGORIZATION

In Study 4, we tested two factors that are potentially relevant to how people think about the near future, and therefore to the cross-period effect. First, we manipulated the way the delays are represented, either as durations or dates. In everyday life, intertemporal choices often involve trade-offs between options represented in terms of dates. Previous research found not only higher patience (Leboeuf 2006; Read et al. 2005) but smaller linearly diminishing impatience over common delays, interpreted as evidence of reduced hyperbolic discounting (Read et al. 2005) when options are presented as outcome dates as opposed to durations until the outcome.

Second, we varied the timing of the survey within a month (collecting data in Week 1 vs. Week 3), to manipulate the length of the salient calendar-based period (i.e., the time until the end of the month). Prior research has identified consumers' sensitivity to temporal category boundaries in a variety of decisions involving perceived duration (Donnelly et al. 2021; Tonietto, Malkoc and Nowlis 2019; Zauberman et al. 2010). More generally, people may use features of the stimulus in a "bottom-up" manner to create context-dependent categorizations (Kaplan and Murphy 2000). Date format makes the calendar-based category cues more salient, compared to

duration descriptions. This suggests that the date format may make people more likely to make decisions based on month categorization.

We test the cross-period effect, based on the subjective financial period as in the prior studies, and assess how robust the effect is to the presentation format. Leveraging the variation in survey timing, we also test whether there is an analogous cross-month effect, and whether it can explain the cross-period effect. Specifically, we test whether participants are more impatient when options cross month boundaries, and if the effect depends on whether the month category is emphasized by the presentation format (with calendar date description) or not (with duration presented). Importantly, we examine if cross-period impatience, based on each participant's current-future financial period categorization, predicts intertemporal choices, over and above any effect of the month-boundary.

Method

To vary the length of the calendar-based time period, we recruited two non-overlapping samples of online participants from Prolific (prolific.co) on two separate days: early in the month (August 4th) and late in the month (August 21st) in a pre-registered study. After exclusions, we collected 345 valid completed surveys (175 early and 170 late in the month).

Participants in each wave of the survey were randomly assigned to either the duration condition or the date condition. In the duration condition, as in the prior studies, the timing of each choice option was presented as the duration of time from today (e.g., "in 1 month"). In the date condition, the same time was instead presented as the date on which the outcome would

occur (e.g., “on September 4, 2020”). This resulted in a 2 (survey date: early vs. late in month) × 2 (presentation format: duration vs. date) between-subjects design.

Each participant made 33 intertemporal choices between \$15 at an earlier date and \$20 at a later date. Thirty pairs of choice options were created by crossing five possibilities for the timing of the sooner (\$15) reward (i.e., the “common delay”: today, 3 days, 1 week, 2 weeks, and 1 month) and six inter-reward delays (3 days, 1 week, 10 days, 2 weeks, 3 weeks, and 1 month). Three additional choices were constructed specifically so that both options were within the same month in one of the survey waves but over different months in the other wave of the survey.

As in the prior studies, we elicited participants’ subjective financial time periods by having them categorize a list of twenty different points in time, displayed in the same format as the times in the intertemporal choices (i.e., a duration or date), into either the current or the future financial period.

This design enabled us to distinguish between *cross-period* effects (based on subjective financial periods, as in the prior studies) and *cross-month* effects. Consider a participant taking the survey on August 4th, who reports having a two-week current financial period. A choice between \$15 in a week (August 11th) and \$20 in two weeks (August 18th) would be a cross-period choice based on self-reported subjective period but not based on calendar month (e.g., both options are in the same month). Conversely, for a participant on August 21st who had a two-week financial period, choosing between \$15 in a week (August 28th) and \$20 in two weeks (September 4th) would be a cross-month choice based on crossing into a new calendar month but would not be a cross-period choice based on self-reported subjective financial periods.

Results

Overall Differences Based on Presentation Format and Survey Timing. Overall, we found more choices of the larger-later options in the date (vs. duration) conditions (proportion of larger-later options per-person, averaged over participants: $M_{\text{Date}} = 0.76$ vs. $M_{\text{Duration}} = 0.57$, Welch's t-test, $t(341.73) = 5.59$, $p < .001$), replicating prior research on duration vs. date asymmetry (Leboeuf 2006; Read et al. 2005). There was no significant main effect of survey date ($M_{\text{Early Month}} = 0.65$ vs. $M_{\text{Late Month}} = 0.67$, $t(342.14) = -0.57$, $p = .57$).

The majority of participants (73%) reported subjective current financial periods that were different from the salient calendar period (end of month). Subjective current periods that matched the end of the month were more common in the date condition (44%) than in the duration condition (10%, $\chi^2(1) = 47.05$, $p < .001$; see online supplement A for details).

Cross-Period and Cross-Month Effects. As our main tests, we compared choices that did vs. did not span relevant boundaries, based on either participants' self-reported categorization or based on the end of the month, separately for the duration and date conditions. We coded two variables: *CrossPeriod* to indicate choices between options that were in different (vs. the same) subjective financial periods for the person, and *CrossMonth*, indicating choices between options in different (vs. the same) months. We first separately tested the cross-period effect (Model 1 in Table 4) and then the cross-month effect (Model 2), controlling for whether the choice involved a present option (*Present*), as well as the length of the common delay and inter-reward delay, and survey date. We then tested both cross-period and cross-month effects in a single regression (Model 3).

TABLE 2**TEST OF CROSS-PERIOD AND CROSS-MONTH EFFECTS (STUDY 4)**

| (a) Duration condition | | | |
|-------------------------------|--------------------|-------------------|-------------------|
| Variable | Model 1 | Model 2 | Model 3 |
| (Intercept) | 0.8 (0.037)*** | 0.79 (0.037)*** | 0.8 (0.037)*** |
| Present | 0.012 (0.012) | 0.016 (0.012) | 0.012 (0.012) |
| CrossPeriod | -0.049 (0.011)*** | | -0.049 (0.011)*** |
| CrossMonth | | -0.002 (0.012) | 0.0003 (0.012) |
| CommonDelay (in years) | 1.1 (0.17)*** | 1.3 (0.17)*** | 1.1 (0.17)*** |
| InterrewardDelay (in years) | -6.5 (0.19)*** | -6.9 (0.23)*** | -6.5 (0.24)*** |
| Late-in-the-month (vs. Early) | -0.0009 (0.051) | -0.00001 (0.051) | -0.001 (0.051) |
| (b) Date condition | | | |
| Variable | Model 1 | Model 2 | Model 3 |
| (Intercept) | 0.92 (0.034)*** | 0.91 (0.034)*** | 0.92 (0.034)*** |
| Present | -0.008 (0.01) | -0.01 (0.01) | -0.012 (0.01) |
| CrossPeriod | -0.039 (0.0095)*** | | -0.034 (0.01)*** |
| CrossMonth | | -0.039 (0.011)*** | -0.032 (0.011)** |
| CommonDelay (in years) | -0.34 (0.15)* | -0.26 (0.14)+ | -0.37 (0.15)* |
| InterrewardDelay (in years) | -4.3 (0.17)*** | -4.1 (0.2)*** | -3.9 (0.2)*** |
| Late-in-the-month (vs. Early) | 0.044 (0.047) | 0.056 (0.047) | 0.055 (0.047) |

NOTE. Linear regression with participant-level random intercepts on the choice of the larger later option (1: larger-later option is chosen; 0: smaller-sooner option is chosen), 33 choices per participant. Significance tests are conducted with R ‘lmerTest’ package. Standard errors are in parentheses. +: $p < 0.1$, *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$

In the duration condition, we replicate our prior findings of a cross-period effect ($B_{\text{CrossPeriod}} = -0.049$, $SE = 0.011$, $p < .001$), with no additional effect of present bias ($B_{\text{Present}} = 0.012$, $SE = 0.012$, $p = .32$). By contrast, there was no detectable cross-month effect ($B_{\text{CrossMonth}} = -0.002$, $SE = 0.012$, $p = .89$). The cross-period effect persists ($B_{\text{CrossPeriod}} = -0.049$, $SE = 0.011$, $p < .001$) controlling for the non-significant cross-month effect, consistent with most participants not using end of month as their current financial period.

In the date condition, we again replicated a significant cross-period effect ($B_{\text{CrossPeriod}} = -0.039$, $SE = 0.009$, $p < .001$). Additionally, we found a significant cross-month effect ($B_{\text{CrossMonth}} = -0.039$, $SE = 0.011$, $p < .001$), suggesting that when outcomes were presented as dates, people were less likely to choose the larger-later option when it crossed into a different month, all else

equal. Importantly, both cross-period and cross-month effects were statistically significant with comparable coefficient sizes when included in a joint regression ($B_{\text{CrossPeriod}} = -0.034$, $SE = 0.01$, $p < .001$; $B_{\text{CrossMonth}} = -0.032$, $SE = 0.011$, $p = .003$). This result suggests that subjective financial period categorization and month boundaries both had parallel but distinct effects on intertemporal choice, when people were prompted to think in calendar terms (i.e., by presenting outcomes as dates).

Discussion

This study demonstrates the robustness of the cross-period effect. We consistently replicate the cross-period effect on intertemporal choices, regardless of salient cues (outcomes presented as duration vs. dates) and when controlling for cross-month effects. The cross-period effect was robust to the date of the survey (i.e., participants making choices either early or late in the month).

However, our results also show that both people's perception of their current financial period and their strategies for making intertemporal choices are somewhat sensitive to contextual factors. Reflecting the effects of contextual cues, participants were more likely to report a subjective financial period that coincided with the end of the month in the date condition than in the duration condition. The significant cross-month effect in the date condition was eliminated in the duration condition, when calendar-based boundaries were less salient (interaction: $B_{\text{CrossMonth} \times \text{Duration (vs. Date)}} = 0.032$, $SE = 0.01$, $p = .051$; see Online Supplement A).

Overall, these results suggest that people make intertemporal choices that are sensitive to options occurring in different subjective financial periods that are largely stable (e.g., as found in

Study 2) and distinct from calendar boundaries. However, their decisions are also sensitive to contextual cues. In particular, making calendar timing more salient increases both the overlap between subjective financial periods and calendar boundaries and makes choices more sensitive to whether the options cross calendar boundaries.

This is consistent with the notion that stable construal and salient context-specific factors are jointly relevant to categorization-related reasoning (Isaac and Schindler 2014; Medin et al. 2003). Consistent with this view, three supplementary studies in the online supplement find that the cross-period effect is sensitive to actual context (spending earmarked to groceries vs. utility bill; Supplementary Study S3) but unaffected by incidental cues (prompts to consider income and expenses in the next two vs. eight weeks; Supplementary Studies S6a-b).

Thus far, we have tested the cross-period effect relative to participants' actual self-reported subjective financial periods. In the final two studies, we employ a hypothetical scenario that enables us to set the length of the current period, and thereby to test the causal effect of different current financial periods on intertemporal choices.

STUDY 5: THE CAUSAL EFFECT OF FINANCIAL PERIOD CATEGORIZATION

To test for a causal effect of subjective financial period categorization on intertemporal choice, we presented participants with a novel scenario and instructed them to assume different hypothetical budget periods (2 vs. 6 weeks remaining). Participants then made scenario-specific intertemporal choices. According to cross-period discounting, we would expect people to discount differently in the specific choices where the manipulated period boundary makes a difference (i.e., the choice options are in different periods in one condition but not the other).

However, we would not expect the manipulation to impact intertemporal preferences in choices where the manipulation does not affect whether the options are in different periods. As a result, the manipulation would not necessarily make people more or less patient overall. For example, in our account, when making a choice between a smaller reward in one week and a larger reward in four weeks, participants instructed that there are two weeks remaining in the current period would be less willing to wait (because the choice options are cross-period) than participants who were instead instructed that there are six weeks remaining (because both choice options are in the same period).

Method

We collected 532 valid complete surveys on Prolific (pre-registered). Participants were randomly assigned to one of two between-subjects conditions: a two-week-remaining or six-week-remaining current budget period. Participants first read the following, accompanied by a visual aid (Figure 4):

Imagine that you are using a budget planner that has eight weeks per page. For convenience, you balance the books every eight weeks in accordance with the planner's organization. [Six weeks/Two weeks] have already passed since you started the current budget period. Hence, the current budget period will end exactly [two weeks/six weeks] from today, as depicted in the picture below.

Participants then reported the number of weeks remaining in the current budget period as a comprehension check. Note that we held constant the total budget period at eight weeks in both

conditions to avoid a potential confound (i.e., a longer total budget period signaling a longer time horizon in general).

FIGURE 4

HYPOTHETICAL BUDGET PERIODS IN STUDY 5



NOTE. Two-week current period condition (left) and six-week condition (right).

All participants answered 28 intertemporal choices, in a randomized order, each between \$40 at a sooner time and \$50 at a later time, with varying common delays and inter-reward delays (see Web Appendix F for the full set of choices). Fourteen of the choices served as *test choices* of the cross-period effect. Seven of these choices were designed so that the options crossed the two-week period boundary, but not the six-week period boundary (“cross-period in two-week condition”). Specifically, in each of these choices, the \$40 option would be received at a specified time sooner than in two weeks, and the \$50 option would be received at a specific later time, between two and six weeks from now. In a similar manner, another seven choices were instead designed so that the options crossed the six-week period boundary, but not the two-week period boundary (“cross-period in six-week condition”).

The remaining 14 choices constituted *control choices*, in which the options did not cross either a two-week or six-week boundary. Specifically, in five of the choices both options were

always in the current period (in less than two weeks; “current period in both conditions”), in another five choices both options were in the current period in the six-week condition but in the next period in the two-week condition (between the two weeks and six weeks from now; “next period in two-week condition and current period in six-week condition”), and both options were always in the next period (more than six weeks from now) in the remaining four choices (“next period in both conditions”).

Results

As predicted, in the test choices, participants’ average preference for the larger-later options overall was significantly lower when the choice options crossed the manipulated period boundary than in the other (no-boundary-crossing) condition ($M_{\text{Cross}} = 0.46$ vs. $M_{\text{Not Crossing}} = 0.58$, Paired t-test, $d = -.12$, $t(531) = -7.76$, $p < .001$).

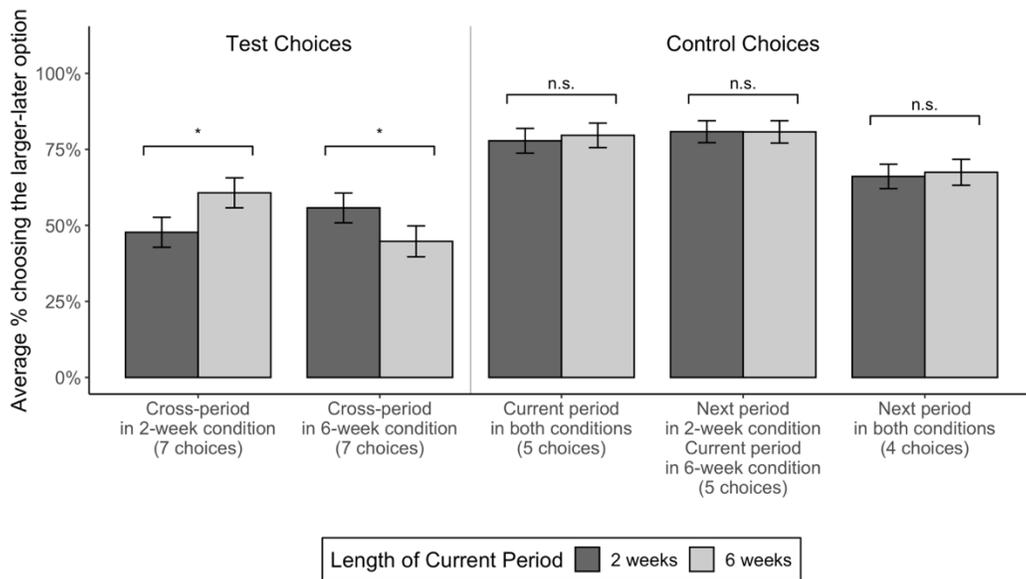
Specifically, as shown in Figure 5, people were less likely to choose the larger-later option in the two-week-remaining condition than in the six-week-remaining condition for choices that only crossed the two-week period on average ($M_{2 \text{ weeks}} = 0.48$ vs. $M_{6 \text{ weeks}} = 0.61$, $t(530) = -3.66$, $p < .001$). The opposite pattern was observed for choice options that only crossed the six-week period, with greater patience in the two-week-remaining condition ($M_{2 \text{ weeks}} = 0.56$ vs. $M_{6 \text{ weeks}} = 0.45$, $t(528.98) = 3.07$, $p = .002$).

By contrast, there was no significant difference between the conditions in any of the three sets of control choices (both options in the current period in both conditions: 0.78 vs. 0.80 , $t(530) = -0.62$, $p = .54$; both options in the next period in the two-week condition but in the current

period in the six-week condition : 0.81 vs. 0.81, $t(529.74) = 0.026$, $p = .98$; both options in the next period in both conditions: 0.66 vs. 0.67, $t(527.69) = -0.45$, $p = .65$).

FIGURE 5

CHOICE PROPORTIONS BASED ON LENGTH OF CURRENT PERIOD (STUDY 5)



NOTE. *: $p < .05$ (t -test). Error bars show 95% confidence intervals.

We tested for the overall cross-period effect on participants' choices using a mixed-effects regression analysis. We predicted participants' choices by whether the choice was cross-period in that participant's randomly assigned condition, controlling for the main effect of condition, fixed effects for choices (to account for the different delays associated with each choice) and participant-level random intercepts. We again found a significant cross-period effect ($B_{\text{CrossPeriod}} = -0.12$, $SE = 0.008$, $p < .001$), suggesting that choice of the larger-later option in a question was on average 12% lower in the condition in which that question's choice options were in different (vs. the same) period. There was no significant effect of condition ($B_{6 \text{ week (vs. 2$

week) = 0.01, SE = 0.027, $p = .71$), suggesting that the manipulated remaining length of the current period did not make participants more or less impatient overall, but only by changing whether a choice was viewed as cross-period or not.

Discussion

Study 5 presents a precise causal test of the proposed cross-period effect. Manipulating the relevant financial period, we find that time preferences differ by condition only in the test trials that were designed to be affected but not for the control choices. In particular, prompting people to adopt a longer current period for the task did not make people more or less patient overall. This seemingly contrasts with some predictions, such as that when people believe that the “present” ends sooner, they will be more likely to make future-oriented choices, such as saving (Hershfield and Maglio 2020).

STUDY 6: BEYOND THE CURRENT BUDGET PERIOD

Thus far, in the studies that measured (studies 2-4) and manipulated (study 5) the subjective current financial period, we only distinguished between the current period and a future period, with all outcomes not in the current period treated as if they occur in the *same* future financial period. We took this simplified approach because we expected the duration of the current financial budgeting period to be particularly salient and relevant for financial decision-making. However, people may budget for more than one period ahead, distinguishing not only between the current period and the subsequent period, but also between a subsequent period and

the one after that. To the degree that people think about their finances in terms of multiple periods, boundaries between different future subjective financial periods would similarly reduce patience for choices in which the options are on opposite sides of the boundary.

In Study 6, we extended the design of Study 5 and test the generalizability of the cross-period effect, beyond only the current financial period, to different future financial periods. We used a manipulation of the financial periods similar to that of Study 5 but included intertemporal choice questions where options involved times beyond the current and second budget periods. This allows us to test whether people are sensitive to the implied boundaries between future financial periods (e.g., over the boundary between the first and second future budget periods).

Method

We collected 419 valid complete surveys from MTurk (sample size and exclusions pre-registered). We excluded participants who failed the attention check to avoid a selective attrition bias (Zhou and Fishbach 2016), but the results were similar when excluding based on the attention check, as pre-registered.

Participants were randomly assigned to one of two conditions, either two-weeks-remaining or six-weeks-remaining in the current budget period. They were presented with the same instructions as in Study 5, except that the budget planner had six weeks per page in total. They made 64 intertemporal choices in randomized order.

As in Study 5, we employed a mix of intertemporal choices that varied in whether the options crossed a budget period boundary (and which period) in a given condition. Some choice options only crossed a boundary in the two-week condition (“cross-period in two-week

condition,” 15 choices), others in the six-week condition only (“cross-period in six-week condition,” 5 choices), and others did not cross a boundary in either condition (“same period in both conditions,” 28 choices). Extending Study 5, we predict higher impatience in the condition where a set of choices are categorized as cross-period, compared to the other condition, in which the same set of choices are categorized as same-period (test choices). By contrast, we predict no effect of condition for the sets of choices for which both options were in the same period in both conditions (control choices). Additionally, we included 16 choices as a second type of control choice that differed from those in Study 5, where the two options in each choice were consistently in different periods (“cross-period in both conditions”; see Web Appendix G for a full list).

A subset of these choices allows us to evaluate participants’ sensitivity to crossing specifically *future* financial boundaries. For three choices, the options crossed the boundary between the second and third periods in the two-week condition and did not cross any boundary in the six-week condition (“future-crossing in two-week condition and non-crossing in six-week condition”). Conversely, for six other choices, the options crossed a future-period boundary in the two-week condition (i.e., between the second and third periods) but crossed the current-period boundary in the six-week condition (“future-crossing in two-week condition and current-crossing in six-week condition”).

Our general cross-period discounting framework predicts more impatience in the two-week condition for the three future-crossing vs. non-crossing choices (i.e., because a future boundary is crossed in the two-week condition but not in the six-week condition). By contrast, our account predicts no difference in patience between conditions for the six future-crossing vs. current-crossing choices. However, if people are only sensitive to crossing the current period

boundary but are not sensitive to future period boundaries (e.g., as in an account of present bias that defines the current period as the present), we should observe the exact opposite effects. Specifically, we should see no differences in the three future-crossing vs. non-crossing choices because the choices do not differ in terms of crossing the *current* period boundary across the two-week and six-week conditions. By contrast, participants in the six-week condition should be more impatient in the six future-crossing vs. current-crossing choices because the choices are cross-period relative to the current period boundary in the six-week condition, but not in the two-week condition.

Results

Overall, we replicated the cross-period effect based on crossing any (either current or future) period boundaries. In the test choices, participants' average preference for the larger-later options was overall lower in the condition in which the choice options crossed a manipulated period boundary than in the non-crossing condition ($M_{\text{Cross}} = 0.37$ vs. $M_{\text{Not Crossing}} = 0.46$, Paired t-test, $d = -0.094$, $t(418) = -6.79$, $p < .001$). Pooling all the data, we confirmed the cross-period effect in a linear regression including fixed effects for choices and participant-level intercepts ($B_{\text{CrossPeriod}} = -0.099$, $SE = 0.008$, $p < .001$). We found no overall effect of a longer current period ($B_{6 \text{ week (vs. 2 week)}} = 0.021$, $SE = 0.027$, $p = .45$).

As a test of whether the cross-period effect extends to crossing future period boundaries, we separately defined a variable for crossing the current period boundary (*CrossCurrentPeriod*) and for crossing the boundary between any two future periods but not the current period boundary (*CrossFuturePeriod*). Using the same regression framework as above, we find a

significant effect of both types of cross-period effects ($B_{\text{CrossCurrentPeriod}} = -0.10$, $SE = 0.008$, $p < .001$; $B_{\text{CrossFuturePeriod}} = -0.087$, $SE = 0.014$, $p < .001$). In fact, adding *CrossFuturePeriod* significantly improved a baseline model with only *CrossCurrentPeriod* ($\chi^2(1) = 38.66$, $p < .001$). These results suggest that the cross-period effect extends not only to crossing the current period but extends to boundaries between subsequent periods.

Next, we looked at the specific choices which provide a test of sensitivity to future financial period boundaries. For the three future-crossing vs. non-crossing choices, participants in the two-week condition, for whom the choices crossed a future period boundary, were significantly less likely to choose the larger-later option than those in the six-week condition, for whom both options were in the second period (0.43 vs. 0.53, $t(416.62) = -2.40$, $p = .017$). This result is consistent with a general definition of cross-period discounting, in which people are sensitive to future financial period boundaries.

By contrast, there was no significant difference between the conditions in the six future-crossing vs. current-crossing choices (0.28 vs. 0.30, $t(416.81) = -0.44$, $p = .66$), consistent with similar sensitivity to both current and future boundaries in cross-period discounting. This pattern of results is the opposite of what would be predicted if people specifically valued outcomes in the current period more (i.e., as if “present-biased” with the entire current period as the present) but were not sensitive to differences between subsequent periods.

Discussion

We replicated the causal cross-period effect from Study 5 and extended the findings to a cross-period effect across boundaries between future periods. This additional discounting over

future periods cannot be explained by present bias or other existing accounts of non-stationary time discounting. These findings suggest that cross-period impatience, as we have theorized, is not only relevant to correcting our understanding of “present” bias but can more broadly explain discontinuities in people’s intertemporal preferences.

GENERAL DISCUSSION

Time-inconsistent preferences in intertemporal choice, the primary “behavioral” deviation from the normative model of time discounting, have typically been attributed to present bias. In this interpretation, which has been widely used as a model of more general self-control failure (Ainslie 1975; Hoch and Loewenstein 1991), people have an impulsive preference for present outcomes. Some tests of the common delay effect have provided support for this view, by showing that people are more likely to choose a sooner outcome when it is in the present (e.g., as opposed to an equivalent trade-off between two options that are both in the future). However, the prior literature, including formal models, has left the timing of a “present” outcome undefined, typically assuming it is only briefly delayed (e.g., received as soon as feasible or on the same day).

We find that people’s intertemporal preferences are not well explained by these theories involving impulsivity and present bias. In particular, we find no significant common delay effect for moderate delays and find a reliable increase in patience only for longer common delays (e.g., 3 months or more, Study 1). Time-inconsistent discounting instead primarily occurred over longer time horizons that correspond to people’s subjective financial planning periods. We propose and find evidence for *cross-period impatience*, in which decision makers are more

impatient specifically when choice options fall on different sides of the boundary between their own subjective financial periods (Studies 2-3). This effect accounts for patterns of choices that would otherwise be interpreted as present bias.

The cross-period effect we document cannot be explained by other constructs theorized to relate to intertemporal choice, such as subjective perceptions of delays or time-varying utility of money (Study 3). The cross-period effect is highly robust, generalizing to different presentation formats (dates vs. durations) and decision timing (early vs. late in the month, Study 4). Further, we find a causal effect of shifting the boundary between the current and future financial periods in a decision scenario on intertemporal choices that differentially crossed the boundary in that scenario (Studies 5-6). Additional studies, reported in the online supplement, demonstrate that the effect is robust to earmarking the funds to specific types of spending (Supplementary Study S3) and to varying the monetary amounts across repeated choices (Supplementary Study S4).

These findings suggest a new framework for understanding consumers' time-inconsistent behaviors. Present bias has often been described as a failure of self-control due to undervaluing future outcomes. Our research suggests that, instead of systematically undervaluing all future outcomes, consumers behave as if outcomes that are in different periods are less fungible. When the more delayed option is perceived as in a different financial period, consumers are less likely to choose to wait. However, as long as the relevant choice options are within the same financial period for that person (i.e., both in the current period or both in the future period), time discounting is relatively stable, contrary to present bias.

The cross-period effect may help account for some otherwise puzzling prior findings. The mixed results in prior tests of the common delay effect may be explained in part by differences in the lengths of the delays (e.g., the units of time used), relative to the financial planning periods of

the participants in those studies (in addition to generally underpowered samples). Our account can also accommodate *reverse* time-inconsistency (greater impatience with a common delay; Read 2001; Read, Frederick and Airoldi 2012; Sayman and Öncüler 2009; Takeuchi 2010). As we showed in Study 2, when adding a common delay shifts the choice options from both being in the current period to instead crossing periods (e.g., the sooner-smaller outcome is still in the present period but the later-larger is now in the future period), people are less willing to wait.

Our cross-period discounting framework may also be relevant to prior findings of heterogeneity in present bias. For example, different participants in Kirby and Herrnstein (1995) required widely varying common delays (ranging between 1 day to 438 days) before their preference reversed. These differences in preference reversals can be well accommodated in our cross-period discounting account by heterogeneity in the subjective current financial period. More generally, our results also suggest that widely documented heterogeneity in discount rates (Urminsky and Zauberman 2015) may not only reflect differences in general patience but could be at least partially confounded with heterogeneity in financial periods, particularly when discount rates are measured using a single item or a limited set of items that do not sufficiently vary in timing.

While we have focused on testing the basic cross-period discounting, additional research would be needed to develop a fully detailed framework for predicting intertemporal preferences. A more limited form of present bias based on immediate reinforcement of biological drives (McClure et al 2007) may occur over and above the effects we have documented, as we did not test immediately consumable present rewards. At the other end of the spectrum, it is not clear how cross-period effects play out over long time periods. Study 6 suggests that people may be sensitive to boundaries between future periods, not only to the boundary between the current and

future period. Additional research is needed to determine whether people are only sensitive to whether the options occur in different periods or if impatience also increases with the number of intervening periods.

Our findings also highlight the broader need to understand how people mentally budget across time periods. The financial periods we have measured are highly heterogeneous across people, but also largely stable (e.g., when re-measured after two weeks in Study 2, or to different times of month in Study 4). In particular, our results suggest that subjective financial periods are typically defined by a relatively stable distant time from the current day. The insight that the subjective current period is often *rolling* is consistent with Lynch et al. (2010)'s finding that consumers' propensity to plan for a given time horizon remains largely consistent over time. Individual's variation in their tendency to plan for different time horizons, however, may be due to a higher propensity to plan for the current financial period.

Attempts to correct present bias have focused on reducing impulsivity and shortsightedness, and on putting the future on an "equal footing" psychologically with the present (e.g., changing the mental construal of outcomes, Zhao, Hoeffler and Zauberman 2007). Our findings suggest that a different set of approaches may be effective, based on reducing the reliance on categorization in intertemporal decisions or the salience of time-period boundaries. That said, our findings also suggest that inconsistent time preferences may also be a consequence of an otherwise beneficial heuristic, using the time periods as mental accounts to simplify managing one's finances.

Consumers' mental accounting of time can have important consequences for their financial behavior (De La Rosa and Tully 2021; Donnelly et al. 2021; Zhang 2017). Our findings have important implications for firms and policymakers making trade-offs between consumers'

impatience and other factors. Viewing consumers through the lens of present bias may create a mistaken belief that providing immediacy will be disproportionately valued by consumers. This may lead firms to over-value the benefit of providing financial resources (e.g., rebates, refunds, incentives) to consumers immediately, when consumers are in fact relatively patient as long as the benefits are received during the current financial period. Firms and policymakers may be able to leverage this, based on an understanding of the length of consumers' current period, by scheduling benefits late in the current period but payments early in the subsequent period.

In the context of consumer goods, expediting delivery can be nonlinearly costly, such that further reducing delivery times becomes disproportionately more expensive. While faster shipping may be a competitive advantage overall, it is notable that the "immediate gratification" business model (e.g., Kozmo.com, Bensinger 2012) has not proven viable. To the degree that our cross-period discounting framework extends to the timing of non-financial tangible goods, it would suggest that consumers may have a "current period" during which they are less sensitive to the precise timing of when goods are received. Firms might therefore be better off providing "just-in-time" delivery (e.g., "Amazon Day Delivery" that includes a feature allowing customers to choose their delivery date), rather than expediting delivery across-the-board.

In conclusion, our research demonstrates that consumers exhibit cross-period impatience. Our cross-period discounting framework can explain time-inconsistent preferences by taking into account discontinuous preferences over subjective financial planning periods. People exhibit higher impatience when choosing between outcomes in different subjective financial periods, which cannot be explained by extant accounts of present bias but is consistent with our framework. Our findings thus offer an alternative view for interpreting and testing time-inconsistent choices and for leveraging consumers' time preferences in practice.

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WEB APPENDIX

This Web Appendix includes supplementary information to the studies presented in the main text, including a detailed report of the exclusion of participants (Web Appendix A) and stimuli for each study (Web Appendices B-G).

Additional information (e.g., exploratory analyses, pre-registered analyses not discussed in the manuscript) is available in the online supplement in the OSF repository

(tinyurl.com/crossperiod).

WEB APPENDIX A. EXCLUSION OF PARTICIPANTS

| Study | Complete ¹ | Passed attention check ² | Current period identified ³ | Final sample | Note (demographics, test of asymmetric attrition if applicable) |
|---------|-----------------------|-------------------------------------|--|--------------|---|
| Study 1 | 1319 | 1318 | N/A | 1318 | 51% women (11 other) $M_{\text{age}} = 40.25, SD_{\text{age}} = 12.96$ |
| Study 2 | 749 | 745 | 734 (consistent) 717 (identified) 601 (longer than two weeks) ⁴ | 601 | 49% women (6 other) $M_{\text{age}} = 40.56, SD_{\text{age}} = 12.37$ No evidence of asymmetric attrition across three between-subjects conditions ($\chi^2(2) = 0.97, p = .61$) |
| Study 3 | 323 | 302 | 285 | 285 | 37% female $M_{\text{age}} = 36.11, SD_{\text{age}} = 11.09$ |
| Study 4 | 435 | 403 ⁵ | 345 | 345 | 56% female $M_{\text{age}} = 32.52, SD_{\text{age}} = 12.55$ No evidence of asymmetric attrition across four between-subjects conditions ($\chi^2(3) = 1.28, p = .73$) |
| Study 5 | 546 | 532 ⁶ | N/A | 532 | 53% female (4 other) $M_{\text{age}} = 30.80, SD_{\text{age}} = 11.83$ No evidence of asymmetric attrition across two between-subjects conditions ($\chi^2(1) = 0.073, p = .79$) |
| Study 6 | 425 | 419 ⁷ | N/A | 419 | 41% female (4 other) $M_{\text{age}} = 36.60, SD_{\text{age}} = 11.86$ No evidence of asymmetric attrition across two between-subjects conditions, only using the attention check ($\chi^2(1) = 0.13, p = .72$) |

¹ Complete from unique IP addresses

² Instructional attention check (Oppenheimer, Meyvis, and Davidenko 2009)

³ A participant's current-future financial period categorization was considered valid if (1) today is categorized as current period, (2) at least one of the times in the list was categorized as future period (i.e., current period is within the span of listed times and thus can be identified), (3) if a time is categorized to be in one's future period, no later time can in the current period.

⁴ Only in study 2, we further restricted assignment of experimental conditions to those who indicated at least two of the times in the given list to be in the current period (i.e., today and 2 weeks from today), such that current period was at least two-week long. This was done to ensure the assignment of conditions did not depend on the current period. (Given that the intertemporal choice used in the study had a two-week delay between the options, those whose current period is shorter than two weeks could not be assigned to the Current Period condition.) Therefore, 717 participants met the criteria described in footnote 2, and 116 participants were not included due to indicating current period of shorter than two weeks.

⁵ Based on two attention checks: general instructional attention check and reporting today's date (only included if match the planned date of the survey).

⁶ Based on two attention checks: general instructional attention check and attention check about the stimuli (report the length of the current period provided in the scenario).

⁷ Study 6 included both general instructional attention check and attention check about the stimuli, but only instructional attention check was used due to asymmetric attrition rate from the stimuli attention check (discussed further in Online Supplement A in the OSF repository).

WEB APPENDIX B. STUDY 1 STIMULI

Page 1

You will be asked to choose between two options of money that you can receive at different times. Selected participants will actually receive what they chose in one of the choices in the form of bonus payment.

Page 2 (Focal intertemporal choice)

Please choose what you prefer between the two options below.

- Receive [\$35/\$40/\$45] [today OR in 2 weeks/1, 3, 6, 9, 12 months]
- Receive \$50 [in 1 month OR 1 month and 2 weeks/2, 4, 7, 10, 13 months]

Page 3 (Exploratory measure)

Please choose what you prefer between the two options below.

- Receive [\$35/\$40/\$45] [in 2 weeks/1, 3, 6, 9, 12 months OR today]
- Receive \$50 [in 1 month and 2 weeks/2, 4, 7, 10, 13 months OR in 1 month]

Page 4 (Attention check)

It is important to make sure that participants have attended to the instruction and information in the survey. For this question, please do not select from the given choices below, but select none of the above and type in 'other' in the field next to the choice.

- \$10
- \$20
- \$25
- None of the above _____

WEB APPENDIX C. STUDY 2 STIMULI

The following sample survey is based on a sample response from a hypothetical participant whose boundary for the current financial period is between 1 month and 1 month and 2 weeks from today.

Page 1

In this survey, you will be asked to choose between two options: amounts of money that would be received at different times.

We will choose one out of every 100 participants completely at random, to receive what they chose in one of the questions (randomly selected) as a bonus payment at the indicated time.

Winners will be notified via email the same day that they take the survey. The choices you make will determine what you get if you are selected but do not affect your chance of being selected.

Page 2 (Financial period categorization)

When you think about managing your financial matters, such as financial planning or managing cash flow and credit, how do you think about the **current financial period** and **future financial periods**?

For each of the following times, please indicate whether you would consider that time part of the current financial period, or part of a future financial period.

| | Current financial period | Future financial period |
|---------------------------------|--------------------------|-------------------------|
| Today | ● | ○ |
| 2 weeks from today | ● | ○ |
| 1 month from today | ● | ○ |
| 1 month and 2 weeks from today | ○ | ● |
| 2 months from today | ○ | ● |
| 2 months and 2 weeks from today | ○ | ● |
| 3 months from today | ○ | ● |
| 3 months and 2 weeks from today | ○ | ● |
| 4 months from today | ○ | ● |
| 4 months and 2 weeks from today | ○ | ● |
| 5 months from today | ○ | ● |
| 5 months and 2 weeks from today | ○ | ● |
| 6 months from today | ○ | ● |
| 6 months and 2 weeks from today | ○ | ● |
| 7 months from today | ○ | ● |

Page 3

Next, we will ask you to confirm how you think about the current financial period and future financial periods, based on your answers to the last question.

Page 4

Based on your answers to the prior question:

[1 month from today] is in your current financial period

[1 month and 2 weeks from today] is in your future financial period

Is this correct?

- Yes
- No (**if No, re-do the questions on Page 2**)

Page 5 (Focal intertemporal choice)

Please choose what you prefer between the two options below.

- Receive \$45 [in 2 weeks (**current period condition**) / in 1 month (**cross-period condition**) / in 1 month and 2 weeks (**future period condition**)]
- Receive \$50 [in 1 month (**current period condition**) / in 1 month and 2 weeks (**cross-period condition**) / in 2 months (**future period condition**)]

Page 6 (if applicable)

Please choose what you prefer between the two options below.

- Receive \$45 today
- Receive \$50 in 2 weeks

Page 7 (exploratory measures)

Earlier, you were asked to choose between receiving \$45 [SS time] and receiving \$50 [LL time].

Is the option of **receiving \$45 [SS time]** in your current financial period or future financial period?

- Current financial period
- Future financial period

Is the option of **receiving \$50 [LL time]** in your current financial period or future financial period?

- Current financial period
- Future financial period

Page 8 (exploratory measures, if Page 6 was shown)

Earlier, you were asked to choose between receiving \$45 today and receiving \$50 in two weeks.

Is the option of **receiving \$45 today** in your current financial period or future financial period?

- Current financial period
- Future financial period

Is the option of **receiving \$50 in two weeks** in your current financial period or future financial period?

- Current financial period
- Future financial period

Page 9 (Attention check)

It is important to make sure that participants have attended to the instruction and information in the survey. For this question, please do not select from the given choices below, but select none of the above and type in 'other' in the field next to the choice.

- \$10
- \$20
- \$25
- None of the above _____

WEB APPENDIX D. STUDY 3 STIMULI

Page 1

In the following questions, you will be given two hypothetical options to choose from that differ in the amount of the reward and in when you receive the reward.

For each question, please choose which one you would prefer, between the two options.

There will be total 30 different questions.

Page 2 (Intertemporal choice, repeated 30 times; see below for a list)

Given the following two options, which would you choose?

Receive \$10 [SS time]

Receive \$20 [LL time]

Page 3 (Attention check)

In the questions above, which of the following dollar values were **not** in either of the options that you chose between?

- \$10
- \$15
- \$20
- I don't remember

Page 4 (Usefulness of money, \$10)

Suppose that you received \$10 today. At what time would this money be most useful to you?

- Today
- One week from now
- One month from now
- Six months from now
- One year from now
- Five years from now

Page 5 (Usefulness of money, \$20)

Suppose that you received \$20 today. At what time would this money be most useful to you?

- Today
- One week from now
- One month from now
- Six months from now
- One year from now
- Five years from now

Page 6 (Financial period categorization)

When you think about financial matters, such as financial planning or budgeting, how do you think about the current financial period and future financial periods?

For each of the following times, please indicate whether you would consider that time part of the current financial period, or part of a future financial period.

| | Current financial period | Future financial period |
|---------------------|--------------------------|-------------------------|
| Today | <input type="radio"/> | <input type="radio"/> |
| One week from now | <input type="radio"/> | <input type="radio"/> |
| One month from now | <input type="radio"/> | <input type="radio"/> |
| Six months from now | <input type="radio"/> | <input type="radio"/> |
| One year from now | <input type="radio"/> | <input type="radio"/> |
| Five years from now | <input type="radio"/> | <input type="radio"/> |

Page 7 (Subjective length of time)

How long do you consider the duration between today and each of the following future times?

Very short

Very long

| | |
|------------------|--|
| One week feels: | |
| One month feels: | |
| Six months feel: | |
| One year feels: | |
| Five years feel: | |

List of intertemporal choices:

| No. | Smaller-sooner option timing (SS time) | Larger-later option timing (LL time) |
|------------|---|---|
| 1 | now | in a week (1 week) |
| 2 | now | in a month (about 4.5 weeks) |
| 3 | now | in six months (about 26 weeks) |
| 4 | now | in a year (about 52 weeks) |
| 5 | now | in five years (about 260 weeks) |
| 6 | in a week (1 week) | in two weeks (2 weeks) |
| 7 | in a week (1 week) | in a month and a week (about 5.5 weeks) |
| 8 | in a week (1 week) | in six months and a week (about 27 weeks) |
| 9 | in a week (1 week) | in a year and a week (about 53 weeks) |
| 10 | in a week (1 week) | in five years and a week (about 261 weeks) |
| 11 | in a month (about 4.5 weeks) | in a month and a week (about 5.5 weeks) |
| 12 | in a month (about 4.5 weeks) | in two months (about 9 weeks) |
| 13 | in a month (about 4.5 weeks) | in seven months (about 30.5 weeks) |
| 14 | in a month (about 4.5 weeks) | in a year and a month (about 56.5 weeks) |
| 15 | in a month (about 4.5 weeks) | in five years and a month (about 264.5 weeks) |
| 16 | in six months (about 26 weeks) | in six months and a week (about 27 weeks) |
| 17 | in six months (about 26 weeks) | in seven months (about 30.5 weeks) |
| 18 | in six months (about 26 weeks) | in one year (about 52 weeks) |
| 19 | in six months (about 26 weeks) | in one year and six months (about 78 weeks) |
| 20 | in six months (about 26 weeks) | in five years and six months (about 286 weeks) |
| 21 | in a year (about 52 weeks) | in one year and a week (about 53 weeks) |
| 22 | in a year (about 52 weeks) | in one year and a month (about 56.5 weeks) |
| 23 | in a year (about 52 weeks) | in one year and six months (about 78 weeks) |
| 24 | in a year (about 52 weeks) | in two years (about 104 weeks) |
| 25 | in a year (about 52 weeks) | in six years (about 312 weeks) |
| 26 | in five years (about 260 weeks) | in five years and a week (about 261 weeks) |
| 27 | in five years (about 260 weeks) | in five years and a month (about 264.5 weeks) |
| 28 | in five years (about 260 weeks) | in five years and six months (about 286 weeks) |
| 29 | in five years (about 260 weeks) | in six years (about 312 weeks) |
| 30 | in five years (about 260 weeks) | in ten years (about 520 weeks) |

WEB APPENDIX E. STUDY 4 STIMULI

Page 1

What is today's date?

Enter today's date in the format of mm/dd/yyyy (e.g., type in 12/25/2018 if today is December 25, 2018.)

In the following questions, please provide your answer as if all questions are being asked **today**.

Page 2

In the following questions, you will be given two hypothetical options to choose from that differ in the amount of the reward and in when you receive the reward.

For each question, please choose which one you would prefer, between the two options.

There will be a total of 33 different questions.

Page 3 (Intertemporal choice, repeated 33 times; see below for the list)

Given the following two options, which would you choose?

Assume that all amounts are guaranteed to be delivered when promised.

Receive **\$15 [SS time]**

Receive **\$20 [LL time]**

Page 4 (Financial period categorization; see below for the full list of times)

| | Current financial period | Future financial period |
|-------------------|--------------------------|-------------------------|
| today | <input type="radio"/> | <input type="radio"/> |
| 3 days from today | <input type="radio"/> | <input type="radio"/> |
| 6 days from today | <input type="radio"/> | <input type="radio"/> |
| ... | ... | ... |

Page 5 (Exploratory measure)

How often do you get paid your main source of income?

- Immediately as soon as I complete my work (more often than once a day).
- Every day
- Every week
- Every 2 weeks, or twice per month
- Every month

- Every quarter (3 months)
- Every 6 months (twice per year)
- Every year (once a year)
- Other _____

Page 6 (Attention check)

In the questions above, which of the following dollar values were **not** in either of the options that you chose between?

- \$10
- \$15
- \$20
- I don't remember

List of intertemporal choices:

| No | SS time (\$15) | LL time (\$20) | Date of SS (early-month) | Date of LL (early-month) | Date of SS (late-month) | Date of LL (late-month) |
|-----------------|----------------|------------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| 1 | today | in 3 days | August 4, 2020 | August 7, 2020 | August 21, 2020 | August 24, 2020 |
| 2 | today | in 1 week | August 4, 2020 | August 11, 2020 | August 21, 2020 | August 28, 2020 |
| 3 | today | in 10 days | August 4, 2020 | August 14, 2020 | August 21, 2020 | August 31, 2020 |
| 4 ¹ | today | in 11 days | August 4, 2020 | August 15, 2020 | August 21, 2020 | September 1, 2020 |
| 5 | today | in 2 weeks | August 4, 2020 | August 18, 2020 | August 21, 2020 | September 4, 2020 |
| 6 | today | in 3 weeks | August 4, 2020 | August 25, 2020 | August 21, 2020 | September 11, 2020 |
| 7 | today | in 1 month | August 4, 2020 | September 4, 2020 | August 21, 2020 | September 21, 2020 |
| 8 | in 3 days | in 6 days | August 7, 2020 | August 10, 2020 | August 24, 2020 | August 27, 2020 |
| 9 | in 3 days | in 10 days | August 7, 2020 | August 14, 2020 | August 24, 2020 | August 31, 2020 |
| 10 ¹ | in 3 days | in 11 days | August 7, 2020 | August 15, 2020 | August 24, 2020 | September 1, 2020 |
| 11 | in 3 days | in 13 days | August 7, 2020 | August 17, 2020 | August 24, 2020 | September 3, 2020 |
| 12 | in 3 days | in 2 weeks and 3 days | August 7, 2020 | August 21, 2020 | August 24, 2020 | September 7, 2020 |
| 13 | in 3 days | in 3 weeks and 3 days | August 7, 2020 | August 28, 2020 | August 24, 2020 | September 14, 2020 |
| 14 | in 3 days | in 1 month and 3 days | August 7, 2020 | September 7, 2020 | August 24, 2020 | September 24, 2020 |
| 15 | in 1 week | in 10 days | August 11, 2020 | August 14, 2020 | August 28, 2020 | August 31, 2020 |
| 16 ¹ | in 1 week | in 11 days | August 11, 2020 | August 15, 2020 | August 28, 2020 | September 1, 2020 |
| 17 | in 1 week | in 2 weeks | August 11, 2020 | August 18, 2020 | August 28, 2020 | September 4, 2020 |
| 18 | in 1 week | in 2 weeks and 3 days | August 11, 2020 | August 21, 2020 | August 28, 2020 | September 7, 2020 |
| 19 | in 1 week | in 3 weeks | August 11, 2020 | August 25, 2020 | August 28, 2020 | September 11, 2020 |
| 20 | in 1 week | in 4 weeks | August 11, 2020 | September 1, 2020 | August 28, 2020 | September 18, 2020 |
| 21 | in 1 week | in 1 month and 1 week | August 11, 2020 | September 11, 2020 | August 28, 2020 | September 28, 2020 |
| 22 | in 2 weeks | in 2 weeks and 3 days | August 18, 2020 | August 21, 2020 | September 4, 2020 | September 7, 2020 |
| 23 | in 2 weeks | in 3 weeks | August 18, 2020 | August 25, 2020 | September 4, 2020 | September 11, 2020 |
| 24 | in 2 weeks | in 3 weeks and 3 days | August 18, 2020 | August 28, 2020 | September 4, 2020 | September 14, 2020 |
| 25 | in 2 weeks | in 4 weeks | August 18, 2020 | September 1, 2020 | September 4, 2020 | September 18, 2020 |
| 26 | in 2 weeks | in 5 weeks | August 18, 2020 | September 8, 2020 | September 4, 2020 | September 25, 2020 |
| 27 | in 2 weeks | in 1 month and 2 weeks | August 18, 2020 | September 18, 2020 | September 4, 2020 | October 5, 2020 |
| 28 | in 1 month | in 1 month and 3 days | September 4, 2020 | September 7, 2020 | September 21, 2020 | September 24, 2020 |
| 29 | in 1 month | in 1 month and 1 week | September 4, 2020 | September 11, 2020 | September 21, 2020 | September 28, 2020 |
| 30 | in 1 month | in 1 month and 10 days | September 4, 2020 | September 14, 2020 | September 21, 2020 | October 1, 2020 |
| 31 | in 1 month | in 1 month and 2 weeks | September 4, 2020 | September 18, 2020 | September 21, 2020 | October 5, 2020 |
| 32 | in 1 month | in 1 month and 3 weeks | September 4, 2020 | September 25, 2020 | September 21, 2020 | October 12, 2020 |
| 33 | in 1 month | in 2 months | September 4, 2020 | October 4, 2020 | September 21, 2020 | October 21, 2020 |

NOTE. Participants in the date condition were shown the dates corresponding to their

survey date condition. ¹ Additional choices not constructed from crossing the five common delay

(today, 3 days, 1 week, 2 weeks and 1 month) and six inter-reward delays (3 days, 1 week, 10 days, 2 weeks, 3 weeks, and 1 month).

List of times in in the financial period elicitation:

| No. | Duration | Date (early-month) | Date (late-month) |
|------------|--------------------------------|-------------------------------|------------------------------|
| 1 | today | August 4, 2020 | August 21, 2020 |
| 2 | 3 days from today | August 7, 2020 | August 24, 2020 |
| 3 | 6 days from today | August 10, 2020 | August 27, 2020 |
| 4 | 1 week from today | August 11, 2020 | August 28, 2020 |
| 5 | 10 days from today | August 14, 2020 | August 31, 2020 |
| 6 | 11 days from today | August 15, 2020 | September 1, 2020 |
| 7 | 13 days from today | August 17, 2020 | September 3, 2020 |
| 8 | 2 weeks from today | August 18, 2020 | September 4, 2020 |
| 9 | 2 weeks and 3 days from today | August 21, 2020 | September 7, 2020 |
| 10 | 3 weeks from today | August 25, 2020 | September 11, 2020 |
| 11 | 3 weeks and 3 days from today | August 28, 2020 | September 14, 2020 |
| 12 | 4 weeks from today | September 1, 2020 | September 18, 2020 |
| 13 | 1 month from today | September 4, 2020 | September 21, 2020 |
| 14 | 1 month and 3 days from today | September 7, 2020 | September 24, 2020 |
| 15 | 5 weeks from today | September 8, 2020 | September 25, 2020 |
| 16 | 1 month and 1 week from today | September 11, 2020 | September 28, 2020 |
| 17 | 1 month and 10 days from today | September 14, 2020 | October 1, 2020 |
| 18 | 1 month and 2 weeks from today | September 18, 2020 | October 5, 2020 |
| 19 | 1 month and 3 weeks from today | September 25, 2020 | October 12, 2020 |
| 20 | 2 months from today | October 4, 2020 | October 21, 2020 |

NOTE. Participants in the duration condition were shown the durations, and those in the date condition were shown the dates corresponding to their time-of-the-month condition.

WEB APPENDIX F. STUDY 5 STIMULI

Page 1

Welcome!

In this survey, you will be presented with a short scenario about budgeting or financial planning, and asked to make a series of choices between two options that differ in the amount and timing of the money you will hypothetically receive.

At the end, you will answer some demographics questions.

Please proceed to the next page.

Page 2

Please read the following scenario carefully. You will later be asked questions to check your understanding.

Imagine that you are using a budget planner that has eight weeks per page. For convenience, you balance the books every eight weeks in accordance with the planner's organization.

(Two-week current period condition)

Six weeks have already passed since you started the current budget period. Hence, the current budget period will end exactly two weeks from today, as depicted in the picture below.

| Current Budget Period | | | | | Next Budget Period | | | | |
|-----------------------|------|--------|---------|-------|--------------------|------|--------|---------|-------|
| Week 1 | | | | | Week 1 | Date | Income | Expense | Total |
| Week 2 | | | | | Week 2 | Date | Income | Expense | Total |
| Week 3 | | | | | Week 3 | Date | Income | Expense | Total |
| Week 4 | | | | | Week 4 | Date | Income | Expense | Total |
| Week 5 | | | | | Week 5 | Date | Income | Expense | Total |
| Week 6 | | | | | Week 6 | Date | Income | Expense | Total |
| TODAY → Week 7 | Date | Income | Expense | Total | Week 7 | Date | Income | Expense | Total |
| Week 8 | Date | Income | Expense | Total | Week 8 | Date | Income | Expense | Total |

Balance this period: _____

Balance this period: _____

(Six-week current period condition)

Two weeks have already passed since you started the current budget period. Hence, the current budget period will end exactly six weeks from today, as depicted in the picture below.

| Current Budget Period | | | | | Next Budget Period | | | | |
|----------------------------|------|--------|---------|-------|----------------------------|------|--------|---------|-------|
| Week 1 | | | | | Week 1 | Date | Income | Expense | Total |
| Week 2 | | | | | Week 2 | Date | Income | Expense | Total |
| TODAY → Week 3 | Date | Income | Expense | Total | Week 3 | Date | Income | Expense | Total |
| Week 4 | Date | Income | Expense | Total | Week 4 | Date | Income | Expense | Total |
| Week 5 | Date | Income | Expense | Total | Week 5 | Date | Income | Expense | Total |
| Week 6 | Date | Income | Expense | Total | Week 6 | Date | Income | Expense | Total |
| Week 7 | Date | Income | Expense | Total | Week 7 | Date | Income | Expense | Total |
| Week 8 | Date | Income | Expense | Total | Week 8 | Date | Income | Expense | Total |
| Balance this period: _____ | | | | | Balance this period: _____ | | | | |

Again, there are now [**two weeks / six weeks**] out of eight weeks left in the current budget period. In other words, the current budget period will end in [two weeks / six weeks] from today, and the next period will start after then.

According to the above scenario, when does the **current budget period end** (i.e., the last day of the current budget period) relative to today? In other words, how many weeks are there left in the current budget period?

1 week from today ▾

1 week from today

2 weeks from today

3 weeks from today

4 weeks from today

5 weeks from today

6 weeks from today

7 weeks from today

8 weeks from today

9 weeks from today

10 weeks from today

11 weeks from today

12 weeks from today

13 weeks from today

14 weeks from today

15 weeks from today

16 weeks from today

(if the participant gives the wrong answer, Page 2 is repeated at most once)

Page 3

You will next be asked a series of 28 questions. Each question will ask you to make a choice between two different amounts of money promised at different times.

Please consider all choices as independent from one another. In other words, answer each question as if the options presented in the current choice are the only potential outcomes that will happen.

Please proceed to the next page if you have understood the above instruction.

Page 4 (Intertemporal choice, repeated 28 times; see below for the list)

Imagine you are to receive a one-time sum of money. Your current budget period ends in exactly [two weeks / six weeks] (as displayed below).

(Budget period visual aid reproduced here)

Q__. Given the following choice, which option would you choose?

| | |
|---|---|
| Receive \$40 [SS time] (within [the <u>current</u> / a <u>future</u>] budget period) | Receive \$50 [LL time] (within [the <u>current</u> / a <u>future</u>] budget period) |
| <input type="radio"/> | <input type="radio"/> |

Page 5-6 (Additional, exploratory attention check)

Now, you will proceed to the next part of this survey.

The remaining part of the survey is not related to the instruction about the budget book that you read earlier.

--- Page Break ---

The following question is not related to the questions you have answered earlier.

Imagine that you can choose which of the two sums of money you would like to receive promised at different points in time.

For each choice below, please indicate which of these two payments, Option 1 and Option 2, you would prefer to receive. Imagine that each payment is guaranteed to occur when promised.

| | Option 1 | Option 2 | |
|---------------------|-----------------------|-----------------------|----------------------------------|
| \$816 in six months | <input type="radio"/> | <input type="radio"/> | \$860 in nine months |
| \$213 today | <input type="radio"/> | <input type="radio"/> | \$281 in two years |
| \$791 today | <input type="radio"/> | <input type="radio"/> | \$777 in one month |
| \$457 today | <input type="radio"/> | <input type="radio"/> | \$551 in six months |
| \$1064 today | <input type="radio"/> | <input type="radio"/> | \$1,153 in one month |
| \$600 today | <input type="radio"/> | <input type="radio"/> | \$611 in one month |
| \$816 in six months | <input type="radio"/> | <input type="radio"/> | \$1,028 in one year |
| \$816 in one year | <input type="radio"/> | <input type="radio"/> | \$5,440 in one year |
| \$840 in six months | <input type="radio"/> | <input type="radio"/> | \$10,125 in two and a half years |
| \$791 today | <input type="radio"/> | <input type="radio"/> | \$777 in one month |
| \$816 today | <input type="radio"/> | <input type="radio"/> | \$860 in three months |
| \$400 in six months | <input type="radio"/> | <input type="radio"/> | \$440 in one and a half years |
| \$621 in six months | <input type="radio"/> | <input type="radio"/> | \$670 in six months |
| \$504 today | <input type="radio"/> | <input type="radio"/> | \$524 in one month |

Page 7 (Attention check)

It is important to make sure that participants have attended to the instruction and information in the survey. For this question, please do not select from the given choices below, but select none of the above and type in 'other' in the field next to the choice.

- \$10
- \$20
- \$25
- None of the above _____

List of intertemporal choices:

| No. | Smaller-sooner option (\$40) | Larger-later option (\$50) | Budget categories in two-week condition | Budget categories in six-week condition |
|-----|---------------------------------|-------------------------------|--|--|
| 1 | today | in 1 week | CC | CC |
| 2 | today | in 1 week and 3 days | CC | CC |
| 3 | today | in 2 weeks and 1 day | CF | CC |
| 4 | today | in 3 weeks | CF | CC |
| 5 | in 3 days | in 1 week and 3 days | CC | CC |
| 6 | in 3 days | in 1 week and 6 days | CC | CC |
| 7 | in 3 days | in 2 weeks and 4 days | CF | CC |
| 8 | in 3 days | in 3 weeks and 3 days | CF | CC |
| 9 | in 1 week | in 2 weeks | CC | CC |
| 10 | in 1 week | in 2 weeks and 3 days | CF | CC |
| 11 | in 1 week | in 3 weeks and 1 day | CF | CC |
| 12 | in 1 week | in 4 weeks | CF | CC |
| 13 | in 4 weeks | in 5 weeks | FF | CC |
| 14 | in 4 weeks | in 5 weeks and 3 days | FF | CC |
| 15 | in 4 weeks | in 6 weeks and 1 day | FF | CF |
| 16 | in 4 weeks | in 7 weeks | FF | CF |
| 17 | in 4 weeks and 3 days | in 5 weeks and 3 days | FF | CC |
| 18 | in 4 weeks and 3 days | in 5 weeks and 6 days | FF | CC |
| 19 | in 4 weeks and 3 days | in 6 weeks and 4 days | FF | CF |
| 20 | in 4 weeks and 3 days | in 7 weeks and 3 days | FF | CF |
| 21 | in 4 weeks and 5 days | in 5 weeks and 5 days | FF | CC |
| 22 | in 4 weeks and 5 days | in 6 weeks and 1 day | FF | CF |
| 23 | in 4 weeks and 5 days | in 6 weeks and 6 days | FF | CF |
| 24 | in 4 weeks and 5 days | in 7 weeks and 5 days | FF | CF |
| 25 | in 6 weeks and 1 day | in 7 weeks and 1 day | FF | FF |
| 26 | in 6 weeks and 1 day | in 7 weeks and 4 days | FF | FF |
| 27 | in 6 weeks and 1 day | in 8 weeks and 2 days | FF | FF |
| 28 | in 6 weeks and 1 day | in 9 weeks and 1 day | FF | FF |

NOTE. CC: both options in the current budget period; CF: cross-period; smaller-sooner

option in the current budget period, larger-later option in the next budget period (future period);

FF: both options in the next budget period.

WEB APPENDIX G. STUDY 6 STIMULI

Page 1

Welcome!

This survey consists of three parts.

In Part 1, you will be presented with a short scenario about budgeting or financial planning, and asked to make a series of choices between two options that differ in amount and timing of the hypothetical sum of money you will receive. There will be total 32 questions.

In Part 2, you will answer some questions about a hypothetical product.

In Part 3, you will be asked another series of 32 questions as a continuation of Part 1.

At the end, you will answer some demographics questions.

Please proceed to the next page.

Page 2

Please read the following scenario carefully.

Imagine that you are using a budget planner that has six weeks per page. For convenience, you balance the books every six weeks in accordance with the planner's organization.

(Two-week current period condition)

You started a new budget period four weeks ago, so the current budget period will end exactly two weeks from today, as depicted in the picture below.

| Current Budget Period | | | | | Next Budget Period | | | | | |
|-----------------------|------|--------|---------|-------|--------------------|------|--------|---------|-------|--|
| Week 1 | | | | | Week 1 | Date | Income | Expense | Total | |
| Week 2 | | | | | Week 2 | | | | | |
| Week 3 | | | | | Week 3 | Date | Income | Expense | Total | |
| Week 4 | | | | | Week 4 | | | | | |
| TODAY → Week 5 | Date | Income | Expense | Total | Week 5 | Date | Income | Expense | Total | |
| Week 6 | | | | | Week 6 | | | | | |

Balance this period: _____

Balance this period: _____

(Six-week current period condition)

You just started a new budget period, so the current budget period will end exactly six weeks from today, as depicted in the picture below.

| Current Budget Period | | | | |
|-----------------------|------|--------|---------|-------|
| | Date | Income | Expense | Total |
| Week 1 | | | | |
| Week 2 | | | | |
| Week 3 | | | | |
| Week 4 | | | | |
| Week 5 | | | | |
| Week 6 | | | | |

Balance this period: _____

| Next Budget Period | | | | |
|--------------------|------|--------|---------|-------|
| | Date | Income | Expense | Total |
| Week 1 | | | | |
| Week 2 | | | | |
| Week 3 | | | | |
| Week 4 | | | | |
| Week 5 | | | | |
| Week 6 | | | | |

Balance this period: _____

According to the above scenario, when is the last day of the current budget period? (Please enter numbers only.)

In exactly week(s)

You will next be asked a series of 32 questions. All choices are independent from one another, which means the questions do not depend on the answer to the previous question.

Page 3 (Intertemporal choice Part 1, repeated 32 times; see below for the list)

Imagine you are to receive a sum of money. Your current budget period ends in exactly [two weeks / six weeks] (as displayed below).

(Budget period visual aid from Page 2 is reproduced here.)

Q___. Given the following choice, which option would you choose?

- | | |
|--|--|
| Receive \$40 [SS time] | Receive \$50 [LL time] |
| (within [the <u>current</u> / a <u>future</u>] budget period) | (within [the <u>current</u> / a <u>future</u>] budget period) |
| <input type="radio"/> | <input type="radio"/> |

BREAK (Unrelated survey questions)

Page 4

You have completed Part 2 of this survey.

In the next part, we would like you to ask you another set of questions from Part 1. In the following pages, you will be presented with the same scenario you read earlier, and a series of 32 questions similar to the ones you've answered before.

Page 5

Please recall the scenario you read earlier.

(Information from Page 2 is reproduced here)

Page 6 (Intertemporal choice Part 2, repeated 32 times; see below for the list)

(Questions with the same format as those in Page 3 is reproduced here)

Page 6 (Attention check)

It is important to make sure that participants have attended to the instruction and information in the survey. For this question, please do not select from the given choices below, but select none of the above and type in 'other' in the field next to the choice.

- \$10
- \$20
- \$25
- None of the above _____

List of intertemporal choices:

| No. | SS (\$40) | LL (\$50) | Two-week condition | | Six-week condition | |
|-----|-----------|-----------------------|--------------------|------------------|--------------------|------------------|
| | | | SS budget period | LL budget period | SS budget period | LL budget period |
| 1 | today | in 3 days | 1 | 1 | 1 | 1 |
| 2 | today | in 5 days | 1 | 1 | 1 | 1 |
| 3 | today | in 1 week | 1 | 1 | 1 | 1 |
| 4 | today | in 2 weeks | 1 | 1 | 1 | 1 |
| 5 | today | in 3 weeks | 1 | 2 | 1 | 1 |
| 6 | today | in 4 weeks | 1 | 2 | 1 | 1 |
| 7 | today | in 6 weeks | 1 | 2 | 1 | 1 |
| 8 | today | in 8 weeks | 1 | 2 | 1 | 2 |
| 9 | in 3 days | in 6 days | 1 | 1 | 1 | 1 |
| 10 | in 3 days | in 1 week and 1 day | 1 | 1 | 1 | 1 |
| 11 | in 3 days | in 1 week and 3 days | 1 | 1 | 1 | 1 |
| 12 | in 3 days | in 2 weeks and 3 days | 1 | 2 | 1 | 1 |
| 13 | in 3 days | in 3 weeks and 3 days | 1 | 2 | 1 | 1 |
| 14 | in 3 days | in 4 weeks and 3 days | 1 | 2 | 1 | 1 |
| 15 | in 3 days | in 6 weeks and 3 days | 1 | 2 | 1 | 2 |
| 16 | in 3 days | in 8 weeks and 3 days | 1 | 3 | 1 | 2 |
| 17 | in 5 days | in 1 week and 1 day | 1 | 1 | 1 | 1 |
| 18 | in 5 days | in 1 week and 3 days | 1 | 1 | 1 | 1 |
| 19 | in 5 days | in 1 week and 5 days | 1 | 1 | 1 | 1 |
| 20 | in 5 days | in 2 weeks and 5 days | 1 | 2 | 1 | 1 |
| 21 | in 5 days | in 3 weeks and 5 days | 1 | 2 | 1 | 1 |
| 22 | in 5 days | in 4 weeks and 5 days | 1 | 2 | 1 | 1 |
| 23 | in 5 days | in 6 weeks and 5 days | 1 | 2 | 1 | 2 |

| No. | SS (\$40) | LL (\$50) | Two-week condition | | Six-week condition | |
|-----|------------|-----------------------|--------------------|------------------|--------------------|------------------|
| | | | SS budget period | LL budget period | SS budget period | LL budget period |
| 24 | in 5 days | in 8 weeks and 5 days | 1 | 3 | 1 | 2 |
| 25 | in 1 week | in 1 week and 3 days | 1 | 1 | 1 | 1 |
| 26 | in 1 week | in 1 week and 5 days | 1 | 1 | 1 | 1 |
| 27 | in 1 week | in 2 weeks | 1 | 1 | 1 | 1 |
| 28 | in 1 week | in 3 weeks | 1 | 2 | 1 | 1 |
| 29 | in 1 week | in 4 weeks | 1 | 2 | 1 | 1 |
| 30 | in 1 week | in 5 weeks | 1 | 2 | 1 | 1 |
| 31 | in 1 week | in 7 weeks | 1 | 2 | 1 | 2 |
| 32 | in 1 week | in 9 weeks | 1 | 3 | 1 | 2 |
| 33 | in 3 weeks | in 3 weeks and 3 days | 2 | 2 | 1 | 1 |
| 34 | in 3 weeks | in 3 weeks and 5 days | 2 | 2 | 1 | 1 |
| 35 | in 3 weeks | in 4 weeks | 2 | 2 | 1 | 1 |
| 36 | in 3 weeks | in 5 weeks | 2 | 2 | 1 | 1 |
| 37 | in 3 weeks | in 6 weeks | 2 | 2 | 1 | 1 |
| 38 | in 3 weeks | in 7 weeks | 2 | 2 | 1 | 2 |
| 39 | in 3 weeks | in 9 weeks | 2 | 3 | 1 | 2 |
| 40 | in 3 weeks | in 11 weeks | 2 | 3 | 1 | 2 |
| 41 | in 4 weeks | in 4 weeks and 3 days | 2 | 2 | 1 | 1 |
| 42 | in 4 weeks | in 4 weeks and 5 days | 2 | 2 | 1 | 1 |
| 43 | in 4 weeks | in 5 weeks | 2 | 2 | 1 | 1 |
| 44 | in 4 weeks | in 6 weeks | 2 | 2 | 1 | 1 |
| 45 | in 4 weeks | in 7 weeks | 2 | 2 | 1 | 2 |
| 46 | in 4 weeks | in 8 weeks | 2 | 2 | 1 | 2 |
| 47 | in 4 weeks | in 10 weeks | 2 | 3 | 1 | 2 |
| 48 | in 4 weeks | in 12 weeks | 2 | 3 | 1 | 2 |
| 49 | in 5 weeks | in 5 weeks and 3 days | 2 | 2 | 1 | 1 |
| 50 | in 5 weeks | in 5 weeks and 5 days | 2 | 2 | 1 | 1 |
| 51 | in 5 weeks | in 6 weeks | 2 | 2 | 1 | 1 |
| 52 | in 5 weeks | in 7 weeks | 2 | 2 | 1 | 2 |
| 53 | in 5 weeks | in 8 weeks | 2 | 2 | 1 | 2 |
| 54 | in 5 weeks | in 9 weeks | 2 | 3 | 1 | 2 |
| 55 | in 5 weeks | in 11 weeks | 2 | 3 | 1 | 2 |
| 56 | in 5 weeks | in 13 weeks | 2 | 3 | 1 | 3 |
| 57 | in 7 weeks | in 7 weeks and 3 days | 2 | 2 | 2 | 2 |
| 58 | in 7 weeks | in 7 weeks and 5 days | 2 | 2 | 2 | 2 |
| 59 | in 7 weeks | in 8 weeks | 2 | 2 | 2 | 2 |
| 60 | in 7 weeks | in 9 weeks | 2 | 3 | 2 | 2 |
| 61 | in 7 weeks | in 10 weeks | 2 | 3 | 2 | 2 |
| 62 | in 7 weeks | in 11 weeks | 2 | 3 | 2 | 2 |
| 63 | in 7 weeks | in 13 weeks | 2 | 3 | 2 | 3 |
| 64 | in 7 weeks | in 15 weeks | 2 | 4 | 2 | 3 |

NOTE. Budget period 1 is the current financial period; budget periods 2, 3 and 4 are future financial periods. Choices #60, 61, 62 are future-crossing in the two-week condition (i.e., only crossing a future budget period boundary) but non-crossing (i.e., options are in the same period) in the six-week condition. Choices #39, #40, #47, #48, #54, #55 are future-crossing in the two-week condition but current-crossing (i.e., only crossing the current budget period boundary) in the six-week condition. Choice #16, #24, #32, #56, #64 involved crossing more than one boundary (further discussed in Online Supplement A).