



## Budget Depreciation: When Budgeting Early Increases Spending

Technical Report

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**THINK**  
**FORWARD** INITIATIVE

# BUDGET DEPRECIATION: WHEN BUDGETING EARLY INCREASES SPENDING \*

## TECHNICAL REPORT

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### Abstract

While budgeting in advance is seen as a good practice to control spending, this research shows that budgeting too early for a specific purchase may increase spending. We argue that as the temporal separation between budget setting and actual purchase increases, consumers become more willing to overspend because of what we term “budget depreciation.” Consumers adapt to the reference point set by the budget such that, over time, the budgeted level becomes the status-quo spending. Thus, the more time that passes, the lower the pain-of-payment from the budgeted amount, and the greater the willingness-to-spend. Across a secondary dataset of real estate purchases, one field study, and two experiments, we find evidence that consumers who set a budget further in advance are more likely to overspend relative to their budgets. This effect emerges for single purchase occasions rather than a category of purchases, and because of the hypothesized pain-of-payment process. It emerges because of the hypothesized pain-of-payment process (e.g. effect is stronger among tightwads, who feel greater pain from spending; effect is mitigated under budget reassessment, which prevents pain adaptation).

**Keywords:** mental budgets, budgeting, temporal separation, overspending, pain-of-payment

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# 1. Introduction

Budgeting is often considered a useful tool to control spending. Many financial counselling institutions and financial literacy programs suggest that the first step to financial wellness is to set up a budget (Nagle, 2019). Banks and other personal finance platforms provide services for effective budgeting (e.g. Lockert, 2019), and in response, the number of consumers adopting budgeting and financial planning apps has more than tripled in the last five years (EY Global Fintech Adoption Index 2019). When budgeting for a specific upcoming purchase (e.g. purchasing a house), consumers typically do so in advance, and one might assume that budgeting further in advance helps people reduce their spending. This research explores when and why budgeting early might have the opposite effect, and instead lead to higher spending.

We examine how the amount of temporal separation that occurs between the moment that a budget is set and the moment that a purchase is made affects consumer decisions regarding how much money to spend relative to that budget. Our findings suggest that budgeting too early tends to increase consumers' spending relative to their budgets and may result in overspending. We propose that this overspending behavior arises in part because consumers feel less pain when spending money for which they have budgeted in the distant past compared to money for which they have budgeted in

the near past. Budgeting for a purchase involves deciding to spend money, and this *decision* to spend money on a purchase can produce a hedonic cost, or pain, for the consumer. As time passes after a decision has been made to spend money, consumers begin to adapt to that decision, and the pain associated with spending that money begins to dissipate. We refer to this process of adaptation as "budget depreciation". As a result of this process, those who budget for their purchases in the distant past may be more willing to overspend than those who budget for their purchases in the near past.

This report is organized as follows: we first review the extant literature on mental budgeting and pain of payment and show its relation with the temporal separation consumers experience when setting a budget. Next, we propose our hypotheses and establish empirical evidence for the effect of temporal separation on consumers' spending relative to the budget. Finally, we conclude with a discussion of theoretical and managerial implications and suggestions for future research.

## 2. Theoretical Framework

### *Mental Budgeting*

Mental budgeting is the act of coding and categorizing resource inflows and outflows into “accounts” (Thaler, 1985). Through this cognitive form of bookkeeping, consumers set different mental accounts, earmark accounts and funds for specific purposes and then track their expenses against their budgets (Heath & Soll, 1996).

Funds can be earmarked for categories of multiple purchases (e.g. a \$100 budget for dining expenses this week) or for single purchases (e.g. a \$100 budget for a single dinner). Much of the prior research in budgeting focuses on budgeting for categories of spending, such as budgeting for weekly expenses (Peetz & Buehler, 2009; Ülkümen, Thomas, & Morwitz, 2008), travel expenses (Fernbach, Kan, & Lynch, 2015), or food and entertainment expenses (Cheema & Soman, 2006). In this research, we focus on budgets set for single purchases, and in line with Larson and Hamilton (2012), we use the term budgeting to refer to earmarking money for these purchases.

Consumers often budget with the aim of controlling their spending and saving money. A significant body of literature has explored the factors that can impact whether budgets are effective at achieving this goal (see Zhang & Sussman, 2018 for a review). Budgets are often more effective when they are not too

malleable (Cheema & Soman, 2006), but also when not too inflexible (Heath & Soll, 1996). Sometimes budgets can help people save money (Soman & Cheema, 2011) and prioritize their spending (Fernbach et al., 2015), and sometimes earmarking can be unhelpful (Larson & Hamilton, 2012; Sussman & O'Brien, 2016).

### *Temporal Separation in Budgeting*

The role of time in budgeting has been explored in various contexts, including the effect of sequence and the effect of temporal frames. Sheehan and Van Ittersum (2018) find that the sequence of purchases during a grocery store trip differs for those who do, versus do not, budget for their grocery shopping. Carlson et al. (2015) show that when budget size changes in a descending (versus ascending) sequence, people tend to prefer less variety.

The effect of different temporal frames in budgeting, such as a weekly versus monthly budget, has also been explored. Longer time frames lead to higher and more accurate budget estimates (Ülkümen et al., 2008), and default units of time also lead to higher budget estimates (e.g., setting a weekly budget when one is accustomed to setting a monthly budget; Min & Ülkümen, 2014). People underestimate their spending when budgeting for a general time frame, such as the next week, more than they do when

budgeting for a specific event (Peetz & Buehler, 2013). The temporal frame can also impact choices; bracketing one's budget more broadly increases willingness to spend (Read, Loewenstein, & Rabin, 1999), and longer time windows for future consumption increase preference for vice products over virtuous products (Siddiqui, May, & Monga, 2017).

Because mental budgets are set in advance of purchase occasions (Heath & Soll, 1996), there is typically some amount of temporal separation between the moment that one sets a budget, and the moment that one makes a purchase. This temporal separation can vary greatly, such as when one budgets for a purchase occurring next week, next month, or even next year. However, the role of temporal separation in budgeting has yet to be explored.

### ***Pain of Payment and Budget Depreciation***

When consumers make purchases, they may experience a pain of payment, which can be defined as a "psychological burden of payment" (Prelec & Loewenstein, 1998) or a "hedonic cost" (Gourville & Soman, 1998). Increasing the pain of payment can reduce people's willingness to make a purchase, such as when they have fewer cognitively accessible resources (Morewedge, Holtzman, & Epley, 2007), or when using a more painful form of payment (Prelec & Simester, 2001; Soman, 2001).

The amount of pain that people feel when thinking about a purchase can dissipate over time. Gourville and Soman (1998, page 163) suggest that when a consumer first makes a purchase, for \$40 in this example, "she opens a mental account specific to this transaction and records into that account the full perceived value of the payment...However, as the temporal delay between the \$40 payment and the pending consumption increases, this person adapts to the payment and gradually incorporates it into her status quo. As such, the potential hedonic impact of that payment decreases". This effect is termed "payment depreciation" and is found to have significant impact on sunk-cost effects; consumers are more likely to forgo the benefits associated with a purchase if the payment occurred further in the distant past.

Analogously, one may predict that consumers experience similar feelings of pain when setting a budget and making the *decision to spend money*. Prelec and Loewenstein (1998, pages 19-20) suggest that while mental budgets "have traditionally been interpreted as a self-control device...they may, however, also play the complementary role of facilitating mental prepayment". Consistent with this suggestion, Webb and Spiller (2014) find that simply earmarking money can lead to similar consequences as actually spending money, proposing that earmarking increases the feeling of financial constraint. The heightened perception of financial constraint can lead to the consideration of

opportunity costs (Spiller, 2011) and increased pain of paying (Pomerance, Reinholtz, & Shah, 2018).

Connecting these lines of research, we propose that consumers may experience “budget depreciation” much in the same way that they experience “payment depreciation”. That is, people can adapt over time to the hedonic impact associated with an upcoming payment, similar to how they can adapt over time to the pain of a payment that has already been made. After consumers set a budget for a specific purchase, the budgeted cost becomes a reference point. As time passes, they gradually incorporate that reference point into their status quo, and adapt to the idea of spending that amount of money. This reduces the pain associated with spending the budgeted amount of money. When the moment of purchase finally arrives, consumers experience less pain of payment and thus become more willing to overspend.

### *Hypotheses*

More formally, we hypothesize:

**H1:** As the temporal separation between budget setting and actual purchase increases, people become more willing to overspend their budgets.

**H2:** The change in overspending results from increases in actual spending, as opposed to decreases in budgeted spending.

**H3:** The change in overspending occurs through decreased pain of payment.

## 3. Data & Experiments

### 3.1 Study 1 – Buying a House

The purpose of study 1 was to explore the effect of temporal separation on budget adherence in a real-world context. Buying a house is one of the largest purchases that consumers will ever make in their lives (Thakor, 2010), and most consumers will need to set a budget for an expense of this size. Given the significance of home ownership to consumer financial well-being, we selected this domain to begin our examination of the relationship between temporal separation in budgeting and consumers' willingness to overspend. We collected transaction data from a real estate firm. We predicted that real estate buyers will be increasingly likely to spend more than their original budget as they experience greater temporal separation between the time they set a budget for their real estate purchase and the time they make the purchase decision.

#### 3.1.1. Data

Real estate transaction data was collected from the client management software and transaction journals of a local real estate office for the period from January 2018 to September 2019. We collected the following pieces of information for 103 transactions: 1) temporal separation between budget setting and purchase, 2) budgeted spending range, 3) actual spending amount, 4) age of the buyer, and 5) gender. We did not have access to data on offers that were

made prior to purchase, nor were we given data regarding clients who did not make a purchase.

#### 3.1.2. Analysis

The budget depreciation process implies that temporal separation increases overspending, and that this occurs via higher actual spending rather than lower budgeted spending. We ran the following regression model for transaction  $i$ , using a log-log transformation for spending and temporal separation to account for the positively skewed distribution.

$$\begin{aligned} \ln(\text{Spending}_i) = & \beta_0 + \beta_1 \ln(\text{Temporal Separation}_i) \\ & + \beta_2 \text{Age}_i + \beta_3 \text{Female}_i + \beta_4 \text{Male}_i \\ & + \varepsilon_i \end{aligned}$$

The dependent variable,  $\text{Spending}_i$ , was either overspending, actual spending, or budgeted spending. Overspending was calculated by taking the difference between  $\ln(\text{actual spending})$  and  $\ln(\text{budgeted spending})$ . Because budgets were provided in a range, we used three different measures of budgeted spending (minimum, mean, and maximum).  $\text{Temporal Separation}_i$  was calculated by counting the number of days between the date when buyers first contacted the real-estate office to provide their budget range and the date of their purchase decision. We also included controls for  $\text{age}_i$  (to the nearest decade) and gender (dummy variables for three categories:  $\text{Female}_i = \text{single}$

female,  $Male_i$  = single male, omitted category is both genders/couples).

### 3.1.3. Results

**Overspending.** Controlling for age and gender, we observe that as temporal separation increases by 1%, the amount of actual spending relative to budgeted spending increases by .016% if using the minimum of the budget range ( $t(98) = 1.97, p = .052$ ), by .018% if using the mean of the budget range ( $t(98) = 2.33, p = .022$ ), and by .019% if using the maximum of the budget range ( $t(98) = 2.00, p = .048$ ). Figure 1 depicts a scatterplot of overspending in dollars and table 1 provides estimation results.

**Budgeted Spending.** Controlling for age and gender, we find that temporal separation does not significantly predict budgeted spending, regardless of whether we use the minimum, mean or maximum of the budget range ( $ps > .12$ , see table 1). This suggests that the relationship between temporal

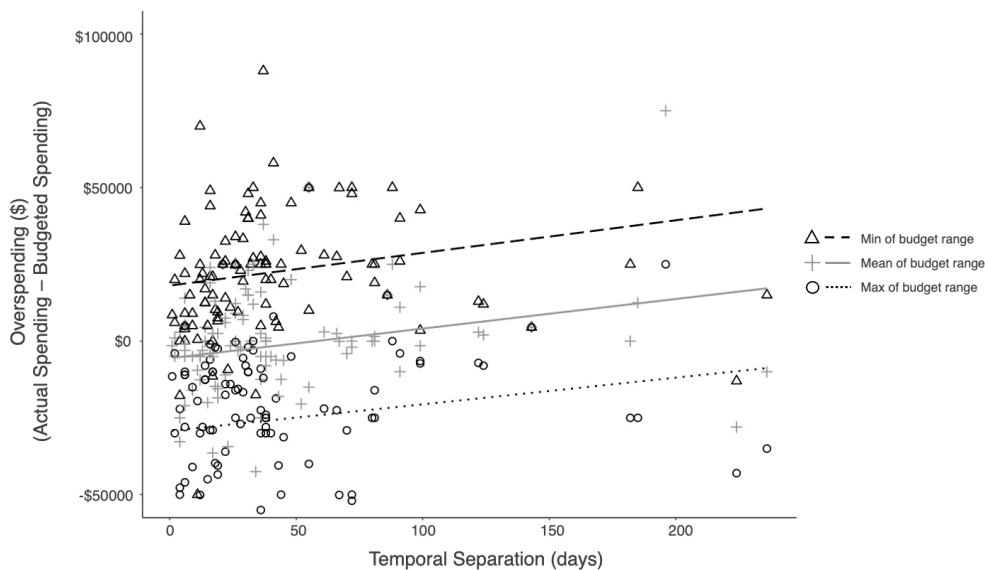
separation and overspending is not driven by lower budget estimates.

**Actual Spending.** Controlling for age and gender, we observe that as temporal separation increases by 1%, the amount of actual spending increases by .085% ( $t(98) = 1.97, p = .052$ ; see table 1). These results suggest that the relationship between temporal separation and overspending may be driven by higher actual spending.

### 3.1.4. Discussion

Using a secondary dataset of real estate purchases, we observe that as temporal separation between budget setting and purchase date increases, people increasingly spend more money relative to their budgets. Further, we find that more temporal separation is associated with higher actual spending, but not lower budgeted spending, which is consistent with the budget depreciation process.

**Figure 1.** Overspending increases with temporal separation in budgeting



\* **Note** – Using real estate transactions, we observe that as temporal separation between the moment of budgeting and purchase increases, the willingness to spend relative to the budget also increases. Although data were analyzed using log-log transformations, they are plotted here in untransformed dollars and days for ease of interpretation.



**Table 1.** The effect of temporal separation on overspending, budgeted spending, and actual spending

Budget Range	Overspending (Actual - Budgeted)			Budgeted Spending			Actual Spending
	Min	Mean	Max	Min	Mean	Max	
Temporal Separation	.016 <sup>*</sup>	.018 <sup>**</sup>	.019 <sup>**</sup>	.068	.067	.066	.085 <sup>*</sup>
Age	.000	-.001	-.001	.003	.003	.004	.003
Female	.015	.018	.020	-.132	-.136	-.138	-.118
Male	-.017	-.012	-.009	-.717 <sup>***</sup>	-.722 <sup>***</sup>	-.725 <sup>***</sup>	-.734 <sup>*</sup>
Intercept	.035	-.026	-.083 <sup>*</sup>	12.189 <sup>***</sup>	12.250 <sup>***</sup>	12.306 <sup>***</sup>	12.224 <sup>***</sup>

\* **Note** – Table 1 provides estimation results for the effect of temporal separation. \*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ .

### 3.2 Study 2 – Buying a Ring

The purpose of study 2 was to explore the causal effect of temporal separation on budget adherence in a field study using random assignment. We investigate a realistic and relatable context for the student population participating in our study: budgeting for their class ring. We contacted undergraduate students, and randomly assigned them to budget for their ring either ten weeks in advance of their purchase, or three weeks in advance of their purchase. Afterwards, we observe how much money they spent on their ring purchase. The class ring field setting was beneficial for several reasons. Firstly, at the university where this study was conducted, over 90% of the undergraduate students purchase a class ring, suggesting that this would be a relevant expense for many students. Secondly, the rings are a sizeable expense, suggesting that budgeting for a class ring would be a relevant activity for many students. Because the male rings were twice as expensive as the female rings, we report separate analyses by gender.

#### 3.2.1. Method

*Participants.* Study 2 was conducted during the period between November 2018 and February 2019. As students typically order their rings during their junior year, we sent out a bulk email to junior class students ( $N = 10,438$ ) at a US university. This study was a three-phase field experiment. All participants were contacted in phase 1 and phase 2, and were randomly assigned to set a budget for their ring in phase 1 (from Nov. 5<sup>th</sup> to 10<sup>th</sup>, 2018) or phase 2 (from Dec. 17<sup>th</sup> to 21<sup>st</sup>, 2018) depending on the temporal separation manipulation. We matched the expense records of our survey participants in phase 3 after the ring order window had closed (Feb. 13<sup>th</sup>, 2019).

*Phase 1 Procedure.* Among those who received the email, 1742 participants completed phase 1 (16.7% response rate). In phase 1, participants first provided demographic information, including age and gender. All participants were then asked to report ring-specific details including whether they 1) already owned the ring at the time of taking the survey, 2) were interested in buying the ring, and 3) were eligible to buy the ring during the indicated ring order window. Students who already owned a ring, or were

not interested in buying a ring, or were not eligible to purchase a ring during the upcoming order window were removed from our study ( $N = 648$ ), leaving 1094 participants in our study.

These participants were then randomly assigned to either set a budget ten weeks prior to purchase (i.e., distant past condition) or three weeks prior to purchase (i.e., near past condition). Those in the three-week condition were reminded to participate in phase 2 and then dismissed. Those in the ten-week condition were asked to set a budget for their ring purchase. Participants were shown a set of ring options, including two gold options and four diamond options. After selecting their options, they set a budget for their ring purchase by entering the cost of the gold and diamond options into a text box that automatically calculated the total cost back for the participants. They were reminded to participate in phase 2 and then dismissed.

At the university where this study was conducted, the rings designed for female and male students differ in size and price. Students were shown the actual options and prices for their gender. Female rings ranged from \$512 to \$859, while male rings ranged from \$1013 to \$1892.

*Phase 2 Procedure.* Seven hundred and eight participants returned for the second phase of the study (64.7% response rate). A binary logistic regression predicting dropout by a 1df treatment

effect showed no differential dropout between conditions (Wald  $\chi^2(1) = .51, p = .48$ ).

Participants in the three-week condition were asked to set a budget to purchase their ring using the same budgeting task that those in the ten-week condition did during phase 1. Participants in the ten-week condition provided demographic information and were reminded of how much they had budgeted in phase 1. This reminder was provided to minimize the possible alternative explanation that participants in the ten-week condition simply forgot how much they had budgeted and thus spent more relative to their budgets.

*Phase 3 Procedure.* During the designated ring order window (Jan. 7<sup>th</sup> to Feb. 13<sup>th</sup>, 2019), 461 participants chose and paid for their class rings (81.1% female,  $M_{age} = 20.49$ ). They also had options to join an alumni charity club for \$25 and to choose shipping for \$20. We obtained individual payment data from the university organization where students placed their ring orders. The number of participants who paid for a class ring did not differ significantly between conditions (Wald  $\chi^2(1) = .98, p = .32$ ).

### 3.2.2. Results

During the period between budget setting and the time when students placed their ring order, the price of the gold options increased. For female rings, prices increased from \$512 to \$522 for the 10k option and from \$617 to \$630 for the 14k option. For male rings, prices increased from \$1013 to \$1037 for the

10k option and from \$1373 to \$1405 for the 14k option. We added the increased price into the budget amount in our analyses to reflect this change. For example, if a participant reported budgeting \$1013 for the gold option, we replaced that number with \$1037 to reflect the new increased pricing in our analyses. Because of the large difference in price ranges for the female and male rings, we ran separate analyses by gender.

*Overspending.* We calculated overspending as the amount spent in phase 3 minus the amount budgeted in phase 1 or 2. Male participants who experienced the ten-week (i.e. distant past) temporal separation were more willing to overspend ( $M_{\text{ten-weeks}} = \$60.03$ ,  $SD = 238.15$ ) than those who experienced the three-week (i.e. near past) temporal separation ( $M_{\text{three-weeks}} = -\$33.80$ ,  $SD = 204.77$ ;  $F(1,85) = 3.87$ ,  $p = .052$ , partial  $\eta^2 = .044$ ). Female participants in the distant past condition were directionally more willing to overspend than those in the near past condition, but the difference was not statistically significant ( $M_{\text{ten-weeks}} = \$4.35$ ,  $SD = 50.32$  vs.  $M_{\text{three-weeks}} = -\$2.64$ ,  $SD = 61.28$ ;  $F(1,372) = 1.47$ ,  $p = .226$ , partial  $\eta^2 < .001$ , see figure 2, panel C).

*Budgeted Spending.* To explore the possibility that people who started budgeting early overspent because their budgets were lower, we compared the budget amounts by temporal separation condition. The amount budgeted did not differ based on temporal separation for both males ( $M_{\text{ten-weeks}} = \$1127.31$ ,  $SD = 187.98$  vs.  $M_{\text{three-weeks}} = \$1080.78$ ,

$SD = 124.27$ ;  $F(1,85) = 1.93$ ,  $p = .168$ , partial  $\eta^2 = .022$ ) and females ( $M_{\text{ten-weeks}} = \$609.67$ ,  $SD = 72.35$  vs.  $M_{\text{three-weeks}} = \$602.04$ ,  $SD = 72.21$ ;  $F(1,372) = 1.03$ ,  $p = .310$ , partial  $\eta^2 = .003$ , see figure 2, panel A).

*Actual Spending.* Next, we compared the actual expense amount between conditions. Male participants who experienced a ten-week separation spent significantly more than those who experienced a three-week separation ( $M_{\text{ten-weeks}} = \$1187.33$ ,  $SD = 271.20$  vs.  $M_{\text{three-weeks}} = \$1046.98$ ,  $SD = 212.69$ ;  $F(1,85) = 7.31$ ,  $p = .008$ , partial  $\eta^2 = .079$ ). Similarly, female participants in the distant past condition spent more than those in the near past condition ( $M_{\text{ten-weeks}} = \$614.02$ ,  $SD = 78.05$  vs.  $M_{\text{three-weeks}} = \$599.40$ ,  $SD = 63.10$ ;  $F(1,372) = 3.87$ ,  $p = .050$ , partial  $\eta^2 = .010$ , see figure 2, panel B).

We also compared actual spending within each budgeting condition to those who were not in our study ( $N = 6293$ ). For males, untreated students spent directionally more money ( $M_{\text{untreated}} = \$1094.22$ ,  $SD = 240.52$ ) than near past budgeters ( $M_{\text{three-weeks}} = \$1046.98$ ,  $SD = 212.69$ ;  $F(1,3051) = 1.94$ ,  $p = .164$ , partial  $\eta^2 = .001$ ), and significantly less than distant past budgeters ( $M_{\text{ten-weeks}} = \$1187.33$ ,  $SD = 271.20$ ;  $F(1,3051) = 5.33$ ,  $p = .021$ , partial  $\eta^2 = .002$ ). The results for females were directionally similar. Although each pairwise comparison was not statistically significant, untreated students spent directionally more money ( $M_{\text{untreated}} = \$605.05$ ,  $SD = 89.14$ ) than near past budgeters ( $M_{\text{three-weeks}} =$

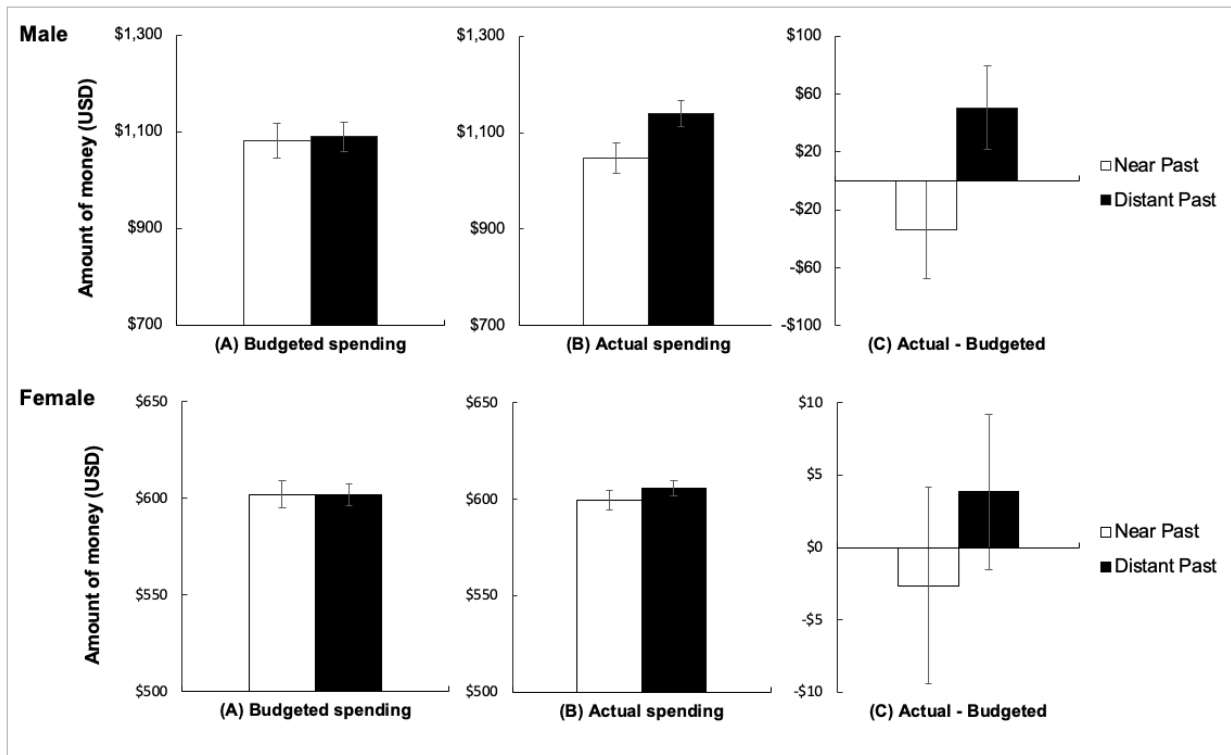
\$599.40, SD = 63.10,  $F(1,3697) = .68$ ,  $p = .411$ , partial  $\eta^2 < .001$ ), and directionally less money than distant past budgeters ( $M_{ten-weeks} = \$614.02$ , SD = 78.05,  $F(1,3697) = 2.01$ ,  $p = .156$ , partial  $\eta^2 = .001$ ).

### 3.2.3. Discussion

We observed that male students who were randomly assigned to experience greater temporal separation between budget setting and purchase for a class ring were more willing to overspend their budgets.

Consistent with study 1, the difference in overspending was driven by differences in actual spending, and not by differences in budgeted spending. For female students, we also observe that greater temporal separation leads to higher actual spending, but not higher budgeted spending. We find that the effect of temporal separation on the overspending measure is directionally consistent with our hypotheses, although not statistically significant.

**Figure 2:** Budgeted spending, actual spending, and their differences by temporal separation



\* **Note** – Compared to people who were randomly assigned to experience a three-week separation (i.e., near past) between budgeting and purchasing, people who experience a ten-week separation (i.e., distant past) budgeted for a similar amount of money (panel A) but spent more money (panel B). Consequently, those in the distant past condition spent more relative to their budget than those in the near past condition (panel C).

### 3.3 Study 3 – Tightwads vs. Spendthrifts

#### Consumers

The goal of study 3 was to provide evidence for the underlying budget depreciation mechanism through mediation and moderation of process. There are chronic differences in the extent to which consumers experience pain of paying; tightwads experience more pain of paying, while spendthrifts experience less (Tightwads-Spendthrifts (TW-ST) scale, Rick et al., 2008). If decreases in pain of paying are truly driving the overspending behavior, then people who naturally experience higher pain of paying (i.e. tightwads) should find that temporal separation has a strong effect on pain and subsequent overspending. In contrast, people who do not typically experience much pain of paying (i.e. spendthrifts) should find that temporal separation does not have a strong effect on pain, and subsequently, won't change their willingness to overspend. Thus, we predict an interaction of temporal separation by TW-ST such that the effect of temporal separation on pain and overspending is stronger for tightwads and weaker for spendthrifts.

#### 3.3.1. Method

We recruited 169 participants from people who came to a university football game (47.6% female,  $M_{age} = 39.0$ ,  $SD = 13.6$ ). No response was removed prior to analysis.

Participants were asked to imagine that they budgeted \$300 either two-months ago (distant past) or one-week ago (near past) to purchase a tablet PC.

Participants then indicated how painful it would be to spend the \$300 that were set aside to buy the tablet PC (1 = not painful at all, 7 = extremely painful). Next, they indicated their willingness to purchase a premium version of the tablet PC with additional storage space and longer battery life at \$330 (1 = very unlikely, 7 = very likely) as a measure for overspending. Based on our observation in study 1 and 2 that greater temporal separation generally increases spending, study 3 specifically focuses on overspending as the dependent variable. Afterwards, we assessed the tendency to experience pain of paying using the TW-ST scale (ranges from 4 to 26) from Rick et al. (2008): 21.3% were tightwads, 56.2% were unconflicted, and 22.5% were spendthrifts. Participants also reported demographic information.

#### 3.3.2. Results

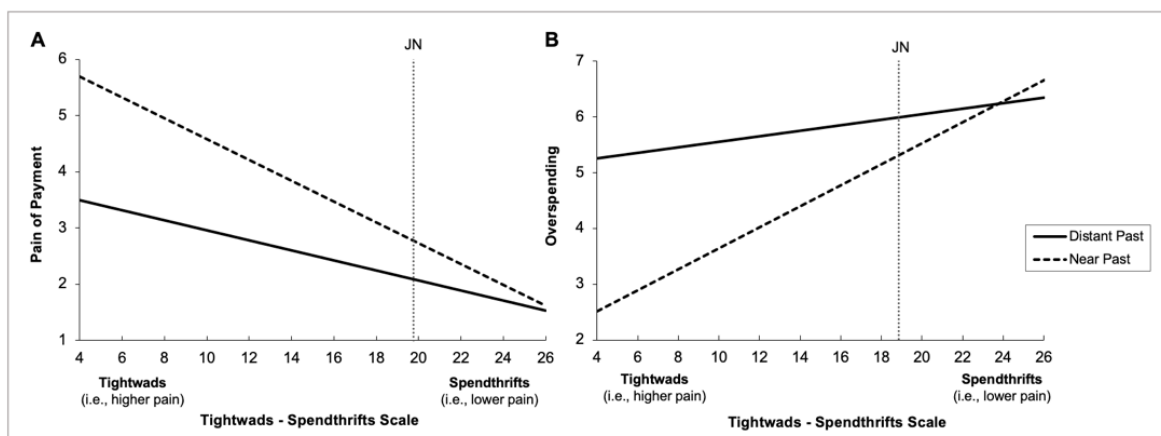
*Overspending.* We ran a regression with temporal separation (0 = near past or one week, 1 = distant past or two months), TW-ST score ( $M = 15.14$ ,  $SD = 4.68$ ), and their interaction term as predictors, and overspending as the dependent variable. We observe a significant interaction between temporal separation and TW-ST score on overspending ( $b = -.14$ ,  $SE = .06$ ,  $t(165) = -2.41$ ,  $p = .017$ ). A floodlight analysis (Spiller et al., 2013) revealed that for all TW-ST scores below the Johnson-Neyman point of 18.85, greater temporal separation significantly increases willingness to overspend (see figure 3, panel B). Thus, the effect of temporal separation on increasing overspending is significant for tightwads

(scores of 4-11) and unconflicted consumers (scores of 12-18), but not spendthrifts (scores of 19-26).

**Pain of Payment.** A regression with temporal separation, TW-ST score, and their interaction term as predictors, and pain of payment as the dependent variable, revealed a marginally significant interaction ( $b = .10$ ,  $SE = .05$ ,  $t(165) = 1.81$ ,  $p = .072$ ). A floodlight analysis revealed that the simple effect of temporal separation on pain of payment was significant for all TW-ST scores below the Johnson-Neyman point of 19.74 (see figure 3, panel A). Thus, the effect of temporal separation on reducing pain of payment is significant for tightwads (scores of 4-11) and unconflicted consumers (scores of 12-18), but not for spendthrifts (scores of 19-26).

**Mediation.** To further test the role of pain of payment in the relationship between temporal separation and overspending, a moderated mediation analysis was conducted; temporal separation (0 = near past or one week, 1 = distant past or two months) was the independent variable, mean-centered TW-ST score was the moderator, pain of payment was the mediator, and overspending was the dependent variable. The analysis (Model 8; Hayes, 2017) suggests moderated mediation ( $b = -.04$ ,  $SE = .02$ , 95% CI: [-.10, -.0010]). Decreased pain of payment mediated the effect of greater temporal separation on increasing overspending for people with TW-ST scores 1SD below the mean ( $b = .68$ ,  $SE = .21$ , 95% CI: [.33, 1.11]) and at the mean ( $b = .51$ ,  $SE = .15$ , 95% CI: [.24, .82]), but not for people with TW-ST scores 1SD above the mean ( $b = .30$ ,  $SE = .16$ , 95% CI: [-.02, .64]).

**Figure 3:** Interaction between tightwads-spendthrifts and temporal separation



\* **Note** – Greater temporal separation leads to lower pain of payment (panel A) and more overspending (panel B) for tightwads but not for spendthrifts.

### 3.3.3. Discussion

Study 3 examines individual differences in experiencing pain of payment, represented as tightwads versus spendthrifts, as a boundary condition to the effect of temporal separation on spending decisions. We replicated the effect that, among tightwads and unconflicted consumers, setting a budget in the distant past (i.e. two months) compared to the near past (i.e. one week) increases willingness to overspend. This effect was mediated by a reduction in the pain associated with spending money. The effect did not occur for spendthrifts, who generally feel little pain upon spending money. Together, these findings lend support for the mediating role of pain of payment on the effect of temporal separation.

### 3.4. Budget Deliberation

The goal of study 4 was to provide additional evidence for the underlying process with a consequential outcome variable, while addressing the limitations associated with scenario studies. Adopting a microcosmic and minimalistic simulation (e.g. Hsee et al., 2013; Shah, Mullainathan, & Shafir, 2012), we simulate an individual's budgeting and purchasing process within the confines of the lab. Participants earn in-lab credits, budget for films they watch in the lab, and experience either a short or long wait period before making a consequential purchase.

The budget depreciation process implies that the ability to adapt to the budgeted amount of money is a necessary condition, and that inhibiting the adaptation process should mitigate the effect of

temporal separation on spending. One way to inhibit the adaptation process is to encourage people to repeatedly deliberate on and reconsider their budgeted spending.

In our prior studies, we assumed that the budgeting decision is closed after the budget is set; after people set their budget, they feel that they have made a decision to spend that amount of money. However, people do not always experience choice closure and may not consider the decision phase complete, even after making a choice (Gu, Botti, & Faro, 2013; 2018). People may revisit a decision and engage in further comparisons with forgone alternatives (Carmon, Wertenbroch, & Zeelenberg, 2003). For those who constantly reevaluate their budget decision, completion of the decision phase is postponed until they stop reevaluating that decision.

In study 4, we randomly assign participants to repeatedly deliberate on their budget after the budget has already been set. This deliberation prolongs the budgeting decision, reducing the amount of temporal separation between the final budget and actual purchase, and suppressing hedonic cost adaptation. If budget depreciation is the underlying process, then those experiencing a long wait who are made to repeatedly deliberate on their budget should behave similarly to those who experience a short wait.

#### 3.4.1. Method

A total of 226 undergraduate students participated in this study. Fifteen participants were removed from

the study due to a technical glitch causing the lab computers to crash, leaving 211 participants for analysis (37.4% female,  $M_{age} = 20.80$ ,  $SD = 2.27$ ). Participants were tested individually while seated in front of a computer screen wearing a headset. Before starting the study, participants were told what to expect in each phase so that they could plan accordingly.

In phase 1 (i.e. earning credits), participants engaged in a credit-earning task. Participants were told they could earn 50, 100, or 150 credits based on the number of e's they could count in an article within one-minute. In actuality all participants received 100 credits.

In phase 2 (i.e. budgeting for films), participants set a budget for the number of credits they would like to allocate to film purchases during the experiment. Each film costs 30 credits for a five-minute viewing. To ensure that participants were aware of the number of budgeted credits, the webpage showed a visual indicating how many credits they had budgeted and how many were left. To create an opportunity cost for their credit usage, participants were told that any credits not spent on films could be used to purchase computer games to play in the fifth phase of the lab session. After writing down their film budget, participants rated pain of payment at the moment of budgeting using a one-item measure: "when you think about the credits you have planned to spend on films, how much pain does this make you feel?" (1 = not painful at all, 7 = very painful; adapted from

Morewedge et al., 2007). Pain of payment towards the budgeted money before experiencing temporal separation did not differ significantly ( $M_{20\text{-minutes}} = 2.06$ ,  $SD = 1.27$  vs.  $M_{5\text{-minutes}} = 1.95$ ,  $SD = 1.33$ ,  $t(209) = -.58$ ,  $p = .562$ ).

Phase 3 (i.e. wait time period) manipulated temporal separation and budget deliberation. Participants were randomly assigned to one of the 2 (temporal separation: 20-minutes vs. 5 minutes)  $\times$  2 (budget deliberation vs. no budget deliberation) experimental conditions. All participants were given crossword puzzles to complete on paper, while the information screen for the films was left open on the computer screen in front of them. This was designed to simulate what happens in life after a budget decision – a person can move on (by playing crossword puzzles), or they can continue to look up product information and deliberate on their decision.

To manipulate deliberation during the wait period, half of the participants were asked to re-assess their budget 5 times during the wait period. Those waiting for 20 minutes reevaluated their budget every 4 minutes, while those waiting for 5 minutes reevaluated their budget every 1 minute. Thus, the final budget decision was made at the same time, regardless of temporal separation condition. After the final budget decision, participants reported on pain of payment.



In phase 4, participants used their credits to purchase and watch films. In phase 5, participants used their remaining credits to purchase and play games.

### 3.4.2. Results

*Overspending.* We calculated the simple difference between the final budget and the actual spending on film purchases as a measure for overspending. A two-way, between-subjects ANOVA revealed a significant interaction between temporal separation and budget deliberation on willingness to overspend ( $F(1,207) = 3.94, p = .048, \text{partial } \eta^2 = .019$ ). For people who did not deliberate on their film budget during the temporal separation, greater temporal separation increased overspending ( $M_{20\text{-minutes*non-deliberators}} = 3.40, SD = 11.26$  vs.  $M_{5\text{-minutes*non-deliberators}} = -3.58, SD = 9.63, F(1,207) = 7.25, p = .008, \text{partial } \eta^2 = .034$ ). However, for people who did deliberate and re-assess their film budget during the temporal separation, temporal separation did not have a significant effect on overspending ( $M_{20\text{-minutes*deliberators}} = -3.52, SD = 13.48$  vs.  $M_{5\text{-minutes*deliberators}} = -3.24, SD = 17.60, F(1,207) = .018, p = .893, \text{partial } \eta^2 < .001$ , see figure 4, panel B).

*Pain of Payment.* A two-way, between-subjects ANOVA revealed a significant interaction between temporal separation and budget deliberation on pain of payment ( $F(1,207) = 4.84, p = .029, \text{partial } \eta^2 = .023$ ). For people who did not deliberate on their film budget during the temporal separation, greater temporal separation marginally decreased pain of payment ( $M_{20\text{-minute*non-deliberators}} = 2.13, SD = 1.44$  vs.

$M_{5\text{-minute*non-deliberators}} = 2.77, SD = 1.76, F(1,207) = 3.54, p = .061, \text{partial } \eta^2 = .017$ ). However, for people who deliberated on their film budget during the temporal separation, temporal separation did not have a significant effect on pain of payment ( $M_{20\text{-minute*deliberators}} = 3.20, SD = 1.74$  vs.  $M_{5\text{-minute*deliberators}} = 2.78, SD = 2.02, F(1,207) = 1.50, p = .221, \text{partial } \eta^2 = .007$ , see figure 4, panel A).

*Mediation.* To further test the role of pain of payment in the relationship between temporal separation and overspending, a moderated mediation analysis was conducted; temporal separation (near past or 5-minute gap = 0, distant past or 20-minute gap = 1) was the independent variable, budget deliberation (non-deliberators = 0, deliberators = 1) was the moderator, pain of payment was the mediator, and overspending was the dependent variable. The analysis (Model 8; Hayes 2017) suggests moderated mediation ( $b = -.97, SE = .71, 90\% \text{ CI: } [-2.24, -.01]$ ). Greater temporal separation marginally increased willingness to overspend through lower pain of paying for people who were non-deliberators ( $b_{\text{non-deliberators}} = .58, SE = .46, 90\% \text{ CI: } [.01, 1.43]$ ), but not for people who were deliberators ( $b_{\text{deliberators}} = -.38, SE = .42, 90\% \text{ CI: } [-1.14, .18]$ ).

*Budgeted Spending.* We also compared the budgeted spending between conditions. A two-way, between-subjects ANOVA did not find a significant interaction between temporal separation and budget deliberation conditions ( $F(1,207) = 2.41, p = .122, \text{partial } \eta^2 = .012$ ), nor were there any significant main

effects of temporal separation ( $F(1,207) = .65, p = .422$ , partial  $\eta^2 = .003$ ) or budget deliberation ( $F(1,207) = 1.24, p = .268$ , partial  $\eta^2 = .006$ ).

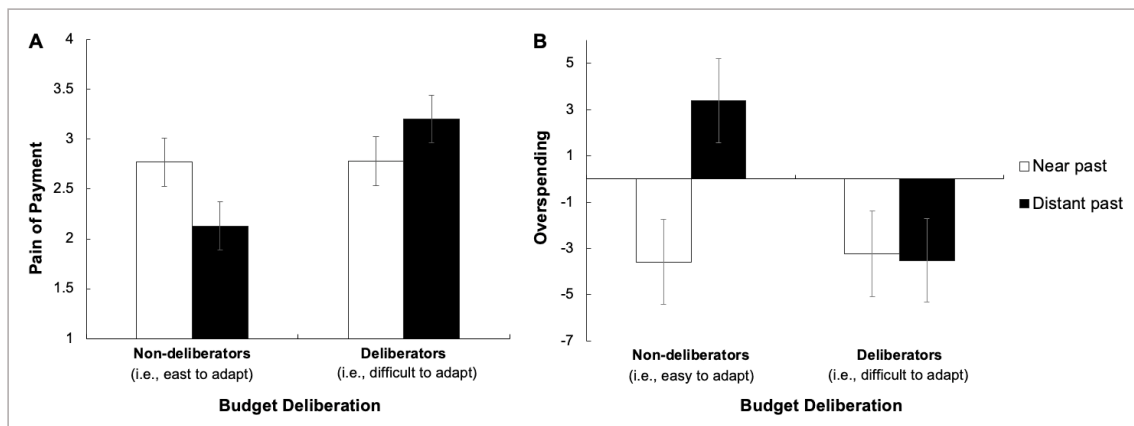
*Actual Spending.* Next, we compared the actual spending between conditions. A two-way, between-subjects ANOVA found a marginally significant main effect of temporal separation such that, collapsing across deliberation conditions, greater temporal separation increased actual spending ( $M_{20\text{-minute}} = 52.43, SD = 20.23$  vs.  $M_{5\text{-minute}} = 46.44, SD = 26.40$ ,  $F(1,207) = 3.40, p = .066$ , partial  $\eta^2 = .016$ ). Unexpectedly, this main effect was not qualified by a significant interaction between temporal separation

and budget deliberation conditions ( $F(1,207) = .20, p = .653$ , partial  $\eta^2 = .001$ ), suggesting that the effect of temporal separation on actual spending was similar across deliberation conditions. There was no main effect of deliberation condition ( $p = .911$ ).

### 3.4.2. Discussion

This study finds that those who experience greater temporal separation spend more relative to their budgets, and that pain of payment mediates this effect, albeit at a 90% CI. For consumers who deliberate on and reassess their budget, pain of payment remains high over time, and consumers are unwilling to overspend.

**Figure 4:** Interaction between Deliberation and Temporal Separation



\* **Note** – Greater temporal separation leads to lower pain of payment (panel A) and higher overspending (panel B) only for those who do not deliberate on their budgets.

## 4. Conclusion

Across a secondary dataset of real estate purchases, a field study, and two experiments, we explore the effect of temporal separation between the moment of budget setting and the moment of purchase. Contrary to popular belief that setting a budget far ahead of a purchase is most helpful, our findings reveal that when single item budgets are set aside far in advance, consumers are more willing to overspend their budgets when it comes time to make the purchase.

### 4.1 Future Directions

#### 4.1.1. *Multiply Determined Process.*

Throughout this article, we observe and provide evidence that greater temporal separation increases spending relative to the budget through decreased pain of payment. However, we recognize that this pattern of overspending is likely driven by multiple factors in real life. For example, product prices could increase during the temporal separation, and consumers might have to increase their spending amount relative to the budget. It is also possible for people to overspend because budgeting for purchases far in advance leads them to feel that the purchases are more important, or because it causes them to get more excited about the purchase. Although we observe evidence consistent with the pain of payment explanation, it would be worthwhile

for future research to determine which other explanations are prevalent.

Relatedly, with the exception of study 1, we generally sought to manipulate and randomly assign the length of temporal separation between budgeting and spending in order to isolate the effect of temporal separation. In reality people may endogenously select the length of temporal separation according to factors that increase the willingness to overspend. For example, consumers who have a strong preference for a product may be both more likely to start budgeting earlier for that product and to overspend their budget for that product. Future research could explore how consumers choose when to begin budgeting for an upcoming purchase.

#### 4.1.2. *Post-Purchase Emotions.*

Another interesting avenue would be to explore the affective consequences of overspending for those who budgeted further in advance. Researchers have documented post-purchase emotions such as satisfaction (e.g. Mano & Oliver, 1993) and regret (e.g. Zeelenberg et al., 1998). How does temporal separation alter the type of emotions that consumers feel after overspending? One prediction might be that consumers are more satisfied with their purchases because the temporal separation they experience prior to the purchase completely removes the

negative emotion attached to overspending. Exploring the impact of temporal separation on post-purchase affective consequences can contribute to our understanding of the different stages in the consumer decision process.

#### *4.1.3 Alternate Patterns of Spending.*

In addition, future research could explore the situations under which greater temporal separation might lead to underspending. While we observe overspending with greater temporal separation, there is also reason to predict that people overestimate budgets in the distant future, leading to underspending. What factors cause one pattern of effects over the other? One might predict that underspending is more common for budgets set with explicit savings goals in mind.

## **4.2 Practical Implications**

In our studies, we observe that consumers are willing to spend about 5-10% more than the budgeted amount when they experience greater temporal separation. This effect might not seem substantial at first glance, but it is worth noting that consumers budget for many different items over a year, and the aggregate impact of temporal separation on overspending for all these different items can be quite substantial. Further, overspending on a single large purchase like a house can have a significant impact on a consumers' overall wealth.

The findings in this research can provide actionable insights for those who offer services on consumers'

financial planning. When analyzing spending habits and providing recommendations for consumers' financial soundness, financial advisors can consider how far in advance consumers typically budget, along with product characteristics and individual differences in personality. For example, when budgeting for hedonic expenses such as vacations, an advisor might recommend a client not budget further in advance than necessary, or might encourage a client to repeatedly reassess the budget decision.

Finally, consumers themselves can also take advantage of these findings to manage their own spending. When planning to make a big purchase (e.g. a house or a car), careful deliberation of the budgeted amount from time to time can prevent overspending.

## **4.3 Final Remarks**

Consumers are frequently told to set budgets in advance, but budget depreciation suggests that budgeting too far in advance can be detrimental. The pain associated with spending dissipates over time and can lead to an increased willingness to spend.

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