Resource Slack and Propensity to Discount Delayed Investments of Time versus Money

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Abstract

We demonstrate that people discount delayed task outcomes due to perceived changes over time in supplies of *slack*. Slack is the perceived surplus of a given resource available to complete a focal task. For temporally near events, investing a resource for one purpose may cause one to fail to attain other short-term goals requiring the same resource, but only if little slack exists. If people foresee less resource competition in the future, they will appear to discount that resource steeply. We use this framework to explain differential propensity to delay investments of *time* and *money*. In seven experiments, we demonstrate that systematic temporal shifts of perceived slack determine the extent and the pattern of delay discounting.
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Many of us have accepted invitations weeks or months in advance to do a review for a journal outside of our field, to serve on some departmental or university committee, or to travel to another university to give a talk, only to regret our decisions when the time arrived to make the time investments promised. Viewed from a distance, the benefits seemed clearly to outweigh the costs, but when the time arrived, the costs seemed much more painful than we had anticipated. “Yes” is often followed eventually by “Damn!” If the same invitations had required more immediate action, we would have said, “No, I’m too busy.” But when asked in advance, we imagine that we will be less busy in the future. Why do we fall prey to the same mistakes again and again? Are we equally prone to make the same mistakes in decisions that involve investments of resources other than our own time – investments of money, for example?

This paper attempts to answer these questions by presenting a general framework for why different resources lead individuals to exhibit different propensities for delay discounting – that is, different degrees of preference to receive a lower reward now rather than a higher reward later, or to incur a large cost later rather than a small cost now. The central construct in our formulation is the notion of perceived changes over time in resource slack. Resource slack is defined as the perceived surplus of a given resource available to complete a focal task without causing failure to achieve goals associated with competing uses of the same resource. Because resources differ in their patterns of gain or loss in slack, we will see different propensities to discount delayed investments for different resources. We will test this framework with a series of experiments comparing preferences to discount delayed investments of two resources, time and money. Our research shows that, in general, people expect slack for time to be greater in the future than in the present. This expectation of growth of slack in the future is more pronounced
for time than for money. Consequently, people generally exhibit greater discounting of future
time investments than of future money investments.

Theoretical Background

The last two decades have seen the growth of a large body of research on how individuals
evaluate and choose options with costs and benefits that are distributed over time. Much
research has used the economic discounted utility model as a baseline (Samuelson, 1937). The
model asserts that utility at time t for a stream of outcomes from time t to some end period T,
\( U_t(c_t, \ldots, c_T) \), is simply the weighted sum of instantaneous utility, \( u(c_{t+k}) \) at each period \( t+k \) over
that range:

\[
U^t(c_t, \ldots, c_T) = \sum_{k=0}^{T-t} D(k) u(c_{t+k}) \quad \text{where} \quad D(k) = \left( \frac{1}{1 + \rho} \right)^k
\]

\( D(k) \), the weight attached to utility in period \( t+k \), will be 1 when \( k = 0 \) (delay = 0). If the
discount factor \( \rho \) is positive, utility in later periods will receive progressively less weight.

Researchers have cataloged numerous anomalies that demonstrate the descriptive inadequacy of
the model (Frederick, Loewenstein, & O’Donoghue, 2002). The model implies two regularities
pertinent to the current paper: that delay discounting is temporally independent and resource-
independent. There is abundant evidence that delay discounting is not temporally independent
and ambiguous evidence with respect to resource-independence, as discussed below.

Temporal-Independence?

Normative theory dictates that if people prefer to invest two units of a resource tomorrow
rather than one unit today, they should also prefer to invest two units a month and a day from
now rather than one unit in a month. Numerous studies show that this assumption systematically
fails. People prefer the larger, later investment rather than the smaller one today, but have the
opposite preferences when all investments are pushed back by a month (Thaler, 1981). This
temporal inconsistency has been modeled using “hyperbolic discounting” wherein a time-dependent discount factor increases as the time of investment approaches (Ainslie 1975; Ainslie & Haslam, 1992, Kirby 1997). Recent work introduced alternative “quasi-hyperbolic” models (Laibson, 1997; O’Donoghue & Rabin, 1999; Zauberman, 2003) that assume that greater weight is given to utility of outcomes in the first period than to subsequent periods, and this disproportionate weight is greater the closer that first period is to the time of the decision.

In both hyperbolic and quasi-hyperbolic classes of models, time-inconsistent preferences have been attributed to the effects of delay through the discounting function (i.e., D(k)) rather than through outcome utility (i.e., u(c_{t+k})). That is, these models assume differences in preference to receive utility now versus utility later rather than differences in the expected utility of consequences as a function of temporal proximity (e.g., Loewenstein & Prelec 1992, p. 579). We will show that a similar pattern of time-inconsistent preferences can occur because of time-dependent changes in utility; people perceive high opportunity costs of investments in the immediate rather than more distant future. We will return to this issue in Experiments 5 and 6 of the current paper and show that temporal inconsistency, or bias towards the present, is greater for investments of time than of money, as predicted by our slack account.

Resource-Independence?

Should we expect to observe similar strength of preference for earlier versus later reward or investment of different resources, such as, time, money, food, entertainment, health, etc? The literature offers mixed support at best for this premise. Some work suggests that delay discounting is a stable individual difference factor that cuts across decision domains involving different resources. In the delay of gratification paradigm introduced by Mischel and colleagues, preschool children might be given a choice between one cookie that can be consumed
immediately or two cookies if they wait for the adult experimenter’s return. Length of time
waiting and delaying gratification reliably predicted academic and social competence in
adolescence (Mischel, Shoda, & Peake, 1988; Shoda, Mischel & Peake, 1990). Other research
ties discount factors to stable individual difference factors. For example addicts are shown to
have higher discount rates than nonaddicts for both money and the substance to which they are
addicted (Kirby, Petry, & Bickel 1999; Madden, Petry, Badger, & Bickel 1997; Petry, 2001b; cf.
Holt Green, & Myerson, 2003).

Favoring the view that the same individuals might discount two resources differentially,
Chapman (1996) estimated two individual-respondent discount rates: one from problems
involving outcomes in money and another from problems involving health outcomes. On
average, these did not differ, but she found little correlation between individual money and
health discount rates in the absence of training on health-money tradeoffs (cf. Chapman, 2002).

An influential theory implying systematically different discount rates for different
resources is Loewenstein’s (1996) work on “visceral factors.” Some stimuli may be discounted at
a steeper rate because they become overpoweringly attractive as they draw nearer (in temporal or
physical distance) when in a state of deprivation, causing drive-like affective reactions. For
example, hunger, thirst, sexual arousal, and sleep deprivation have the potential to overwhelm
other motives that might be deemed by the decision maker to be more important when viewed
from a distance before or after a decision. These visceral factors are contrasted with other more
utilitarian resources that exhibit more “normal” levels of impatience and less pronounced
interaction of stimulus proximity and deprivation state. Similar points are made in Metcalf and
Mischel’s (1999) work on hot/cool systems in delay of gratification and Shiv and Fedorikhin’s
(1999) analysis of choice between hedonic vices like chocolate cake rather than virtues like fruit
salad as a function of mental resources and proximity. Also relevant to our research question is work showing higher discount rates for addictive substances than for money (Baker, Johnson, & Bickel, 2003; Kirby et al., 1999; Madden et al., 1997; Petry, 2001a).

The research we report provides evidence that propensity to discount delayed expenditures is greater for time than for money. We appeal to a situational theory of resource slack rather than to the operation of stable individual-difference factors or to distinctions of visceral and utilitarian resources. The resources we compare are not in any sense addictive, so our research cannot explain the special properties of addictive or visceral resources. Nor can we offer an explanation of the discounting behavior of non-humans (Ainslie, 1974; Ainslie & Haslam, 1992). However, we will show that purely utilitarian resources can exhibit patterns of “hyperbolic” discounting that have been seen as characteristic of visceral factors (Loewenstein, 1996).

Resource Slack and Propensity to Delay

A persistent problem in human life is the existence of multiple goals that compete for the use of a single limited resource pool (Gollwitzer, 1999; Miller, Galanter, & Pribram, 1960; Shah, Friedman, & Kruglanski, 2002). We propose that people will strongly discount delayed outcomes – that is, prefer greater future costs of a certain resource to smaller immediate ones – under the following conditions:

a. People perceive that immediate investment would block them from obtaining other proximate activated goals requiring the same resource; and

b. They perceive that, in the future, they would have more slack and thus less sacrifice of other highly valued goals.

Put differently, discounting and desire to delay investment are driven by perceptions of slack gain (or loss) for a given resource over time.
This perspective asserts that delayed outcomes of even completely utilitarian, non-hedonic resources can be discounted sharply when investment of those resources blocks attainment of other active goals in the present but not the future. Consequently, two resources may be discounted at different rates if people perceive slack to be more likely to grow over time for one than for the other. We predict that “hyperbolic” discounting will arise when resource slack for time $t$ is less than that at $t+n$ and the difference is greater when $t$ is very near than when it is more temporally distant. Reverse delay discounting – preference for more immediate investment – will arise whenever slack in the future is perceived to be lower than that in the present.

Time versus Money

We test our general slack concept of delay discounting by contrasting delay decisions for two resources, time and money. We chose these two resources because both are utilitarian, not visceral in nature, and are ubiquitous in our day to day decisions.

Prior research shows that time and money are treated differently in decision-making. Soman (2001) showed that sunk cost effects reliably found for money investments do not replicate with time investments. Leclerc, Schmitt & Dube (1995) found that people were risk-seeking for money in the domain of losses, but risk averse when the gambles involved losses of time (cf. Okada & Hoch, in press).

More pertinent to our research, Soman (1998) found that retail promotions that offer a money gain but that require time/effort expenditure to redeem become more attractive if money and time expenditure are both delayed rather than immediate. When a rebate was immediate, both the size of the rebate and the distance to be traveled had significant effects on choice of the promoted versus unpromoted option. But when rebate redemption was delayed, the simple effect of the size of the rebate did not diminish, but the effect of the time required (travel distance) to
redeem the rebate became vanishingly small. Soman interpreted his results as showing that
time/effort is discounted more than money.

Alternatively, his results can be explained by temporal construal theory (Liberman &
Trope, 1998; Trope & Liberman, 2003) that holds that, in the more distant future, people
represent events by “high level” construals that focus on the benefits and desirability of
outcomes. In the more immediate future, they represent the same events by “low level”
construals that focus on constraints and the feasibility of attaining outcomes. Put in these terms,
Soman (1998) found that, with delay, the relative weight of feasibility (travel time costs)
decreased relative to desirability (monetary reward). Temporal construal theory would not
predict differences in discounting between time and money when both are rewards or both are
costs. In contrast, our account posits that time investments are, in general, more steeply
discounted than are money investments. In our studies, we unconfounded the time versus money
comparison from the contrast of benefits versus costs by presenting both time and money as
costs. In Experiment 4, we also consider the case where both are benefits.

Resource Slack Theory and Delay Discounting of Time and Money

We suggest that, for time, people will perceive less slack now than in the future. This
perception cannot hold true in aggregate. On average, we will be just as busy a month or two
weeks from now as we are today. But that’s not how it appears to us in everyday life. We often
make commitments long in advance that we would never make if the same commitments
required immediate action. That is, we discount future time investments relatively steeply.

Why don’t people realize that they will not truly have more slack time in the future than
they have today? Research on the planning fallacy shows that people underestimate task
completion times for tasks stretching out into the future (e.g., Buehler, Griffin, & Ross, 1994).
Buehler et al. interpret this in terms of base-rate neglect for the focal task. For example, if the focal task is writing a paper, this would imply that people ignore how long it has taken them to write papers in the past. We, on the other hand, suggest that people underestimate task completion times for a focal task in the future because they are bad at imagining future competition for their time.

For money, we postulate that most people expect that slack now and in the future are more nearly equal. Barring some change in their employment or family status, supply and demand of money is relatively constant over time, and people are aware of that. Compared to demands on one’s time, money needs a few weeks or months in the future are relatively predictable from money needs today. In addition, compared to time, money is fungible (Leclerc et al., 1995; Okada & Hoch, in press). Fungibility is the degree to which a unit is exchangeable or substitutable – in our case, across time periods. People often can borrow when there is an unexpected immediate demand on money resources. Consequently, we expect perceived time slack at time \( t \) and \( t+n \) to be less similar for time than for money, especially as time \( t \) draws near.

As a consequence of perceiving relatively less slack gain for money than for time, we expect that people will exhibit shallower discounting and less present-biased preferences for future money investments than they do for future time investments.

These predictions hold in the modal case. Under circumstances in which people expect equivalent slack gain for time and for money, we would expect no differences in the propensity to discount delayed outcomes – that is, equivalent strength of preference to delay investments of time versus money. The main thesis of this paper is that the relative rate of delay discounting for two resources, A and B, will depend on the relative rates at which people expect to gain or lose slack for those resources.
We test these conjectures in seven experiments. Experiment 1 shows that people expect more growth in slack in the future for time than for money. Experiment 2 demonstrates that people exhibit steeper delay discounting when required investments are framed in terms of minutes of effort rather than equivalent dollars. Experiment 3 shows that this result is not due to the lower utility of minutes compared to dollars, and Experiment 4 shows that the result holds for both gains and losses of time and money. Experiment 5 demonstrates that “hyperbolic” discounting is more pronounced for time (minutes) than for numerically equivalent units of money (dollars). These results are consistent with evidence in Experiment 6 that people perceive time slack (but not money slack) to be especially scarce in the very near term compared with any point in the intermediate term. Experiment 7 demonstrates that measures of expected gains in slack for time and for money account for time versus money differences in revealed preference to delay investments.

Experiment 1: Future Slack Gain for Time versus Money

Experiment 1 tests the hypothesis that for time, people expect to have more available slack in the future than they do today. We predict that this expectation of growth in slack will be greater for time than for money – that is, that expected time slack gain will be greater than expected money slack gain for an equivalent time period.

Method

Subjects. Ninety-five undergraduates were recruited on campus and asked to complete a one-page, double-sided questionnaire in exchange for a candy bar. Seventy-six completed both sides, and only these respondents’ data are reported below.

Procedure. Respondents received a double-sided questionnaire with questions measuring time slack gain and money slack gain. Order of the two pages was counterbalanced and had no
effect (F(1,74) = 0.01, p = .92). One side of the page, labeled “Thinking about your schedules,” asked:

“Think about your activities today and your available spare time. Now consider your likely activities and available spare time for the same day of the week a month from now. On which day do you expect to have more spare time?”

Subjects circled a response on a scale anchored 1 (much more time available today) and 10 (much more time available next month).

The other side of the page, labeled “Thinking about your budget,” asked:

“Think about your expenses today and your available spare money. Now consider your likely expenses and available spare money for the same day of the week a month from now. On which day do you expect to have more financial reserves?”

Participants responded on a 10-point scale (1 = much more money available today, 10 = much more money available next month).

Results and Discussion

For both time (M = 8.2, SD = 2.9) and money (M = 7.0, SD = 2.9), respondents believed that the resource would be more available in a month than today. Means for time (t(75) = 10.10, p < .001, \(\omega^2 = 0.571\)) and money (t(75) = 4.80, p < .001, \(\omega^2 = 0.225\)) both differed significantly from the scale midpoint of 5.5.\(^1\) But the key result was that, as predicted, this belief that slack would be greater in the future was stronger for time than for money, t(75) = 2.54, p = .013, \(\omega^2 = 0.067\).\(^2\)

The results also indicated that there was no significant correlation between the measure of

\(^1\) All \(\omega^2\) values cited in this paper are partial \(\omega^2\), excluding variance components for ANOVA terms unrelated to the effect being tested (Keren & Lewis 1979). Partial \(\omega^2 = \sigma^2_{\text{Effect}} / (\sigma^2_{\text{Effect}} + \sigma^2_{\text{Error}})\).

\(^2\) The between-subjects analysis using the first trial for all 95 respondents yields the same results: Time M = 8.65 (SD = 2.3, n = 48); Money M = 7.30 (SD = 2.7, n = 47), t(93) = 2.62, p = .01.
slack gain for time and for money ($r = -.11, p = .366$). This suggests that perception of expanding future slack is not a general trait (e.g., optimism) that cuts across domains.

We predict that the stronger the sense that slack will be more available in the future compared to now, the stronger should be observed delay discounting. Thus, we expect that discounting should be greater for investments that involve time than for those that involve money. Experiment 2 tested this prediction.

Experiment 2: Discounting of Future Time versus Money

In Experiment 2, respondents were presented with two alternatives, one with a high one-time set-up cost and a low per-period usage cost and the other with a low set-up cost and a high per-period usage cost. We measure delay discounting by the number of uses respondents required to be indifferent between the two options. The higher that number, the more weight respondents are giving to immediate setup costs in comparison with minimizing future per use costs. We manipulated whether these costs were expressed in terms of minutes or numerically identical dollars. Because, in Experiment 1, we had found that people perceive more future slack gain for time than they do for money, we expected to find in Experiment 2 that people required more uses to equate the value of high and low setup cost options when costs were expressed in terms of time rather than money.

Method

Subjects and design. Respondents were 68 undergraduates who participated in partial fulfillment of a research requirement in an introductory marketing course. They were randomly assigned to one of two conditions in which immediate and future investments were both described in terms of either time or money.

Procedure. Respondents completed a questionnaire labeled “Internet Shopping Study.”
They were asked to put themselves in the position of a consumer considering two alternative online information service providers. In the Time condition, they were told

“...Each provider’s site is characterized by two central features, the time it takes to set up in order to use the site, and then the time it takes to evaluate the products and process the purchase. Information providers differ in the length of time required to complete each part. The set up stage is required only once when you initialize that service and the evaluation stage applies to every visit. Assume that both providers are equally reliable, contain the same level of information, and are similar in the time they take to use.

Consider only the following two information service providers:

Information Provider A. To use this information service provider requires a one-time initial set-up, and an ongoing evaluation process. This provider requires a 2-minute set up stage in order to initialize the service and a 15-minute per use process for evaluating options and finalizing their use.

Information Provider B. To use this information service provider requires a one-time initial set-up, and an ongoing evaluation process. This provider requires a 25-minute set up stage in order to initialize the service and an 8-minute per use process for evaluating options and finalizing their use.

How many uses would you need over the next year before you would be just indifferent between selecting provider A and provider B?

____ times over the year (give a number)’’

In the Money condition, the problems were identical, except that references to time were changed to money. Information provider A was described as requiring a $2 set up fee and a $15 per use fee. Provider B was described as requiring a $25 set up fee and an $8 per use fee.
Results and Discussion

If respondents did not discount future costs at all, the high setup cost option would be more attractive in period 4 and beyond. The results show that in the time condition, respondents required more periods to match the attractiveness of the high and low setup cost options (M = 9.6, SD = 11.0) than was true when the same problems were expressed in terms of money (M = 4.1, SD = 2.4), t(66) = 2.96, p = .004, $\omega^2 = 0.102$. Because the variances were unequal in the two conditions, we also computed a Mann-Whitney non-parametric test, yielding the same results (U = 325.5, p = 0.002). Medians were 6 and 3 for time, and money, respectively.

Consistent with our slack argument, Experiment 2 suggests that people have a higher discount rate for time than for money. In this study we nominally equated the dollar value and minutes associated with money and time investments. Of course, this equating is illusory—units of time and money are arbitrary and there is no reason to assume that the nominally equal units of time versus money are equal in utility. Prior research has shown that small outcomes are discounted more than large (Raineri & Rachlin 1993; Shelley 1994; Thaler, 1981). If our time units (minutes) are worth less than money units (dollars), might the apparent greater discounting of time than money be a reflection of a (confounded) magnitude effect? To eliminate this alternative explanation we conducted a follow-up experiment.

Experiment 3: Magnitude Effect or Resource Differences in Discounting of Time and Money?

The current experiment was designed to test whether the time versus money differences in delay discounting are due to the magnitude effect. Experiment 3 used the same basic procedure as Experiment 2 but manipulated the cost structure. In replicate 1, the cost structure was very similar to that used in Experiment 2, equating the nominal values of minutes and dollars. In replicate 2, we doubled all the time costs and halved all the money costs compared to their
counterparts in replicate 1. The $1 / four minutes ratio in replicate 2 corresponds to an exchange rate of $15 / hour, compared to the $60 / hour in replicate 1. If time was discounted more than money in Experiment 2 because $1 is more valuable than 1 minute, replicate 2 should make time and money more similar in value than in replicate 1. Therefore, replicate 2 should reduce, eliminate, or reverse the time versus money difference in discounting found in replicate 1 and Experiment 2. If the results of Experiment 2 are truly due to the difference of time and money, replicates 1 and 2 should not differ.

Method

Subjects and design. Participants were 241 MBA students randomly assigned to one of the four conditions (time versus money x cost structure replicate 1 versus 2). 4

Procedure. Experiment 3 used the same procedure as Experiment 2, but with an important modification -- the manipulation of the cost structure. In replicate 1, the cost structure was very similar to that used in Experiment 2: Provider A required a 2-unit set up fee and 16 units per use cost versus provider B requiring a 28 units set up cost and an 8 units per use cost. These costs were expressed in terms of either minutes or the same number of dollars. In replicate 2, we doubled all the time costs and halved all the money costs compared to their counterparts in replicate 1. For replicate 2, in the time condition, Provider A required a 4-minute set up and 32 minutes per use. Provider B required a 56-minute set up and 16 minutes per use. In the money condition, provider A required a $1 set up and $8 per use fee. Provider B required a $14 set up and $4 per use fee. Again, respondents reported the number of uses that would make Providers A and B equally attractive.

3 Thanks to Peter Ayton for suggesting this alternative explanation.
4 One extreme outlier from the time condition was dropped from the analysis. This respondent’s matching response of 300 was 42 SDs above the mean of his/her cell without that response.
Results and Discussion

If respondents did not discount future costs at all, the high setup cost option would be more attractive in period 4 and beyond. A two-way ANOVA revealed a main effect for resource \(F(1,236) = 5.79, p = .017, \omega^2 = 0.020\), but no main effect for cost structure \(F(1,236) = 0.4, p = .53\) and no interaction \(F(1,236) = 0.18, p = .67\). Results are shown in Figure 1. In the time condition, respondents required more periods to match the attractiveness of the high and low setup cost options \(M = 7.3, SD = 8.0\) than was true when the same problems were expressed in terms of money \(M = 5.2, SD = 5.7\), \(t(238) = 2.4, p = .017, \omega^2 = 0.020\). A Mann-Whitney non-parametric test yielded the same results \(U = 5629.0, p < .005\). Medians were 5 for time and 4 for money in both replicates.

Perhaps our manipulation of the ratio of time costs to money costs was too weak, and changing the ratio of time costs to money costs from 1:1 to 4:1 was not enough to eliminate the time money difference. But the absence of any resource by cost structure interaction increases our confidence that our results in Experiment 2 were due to time versus money differences in implicit levels of delay discounting, rather than to a magnitude effect (i.e., to more valuable money costs than time costs).

Experiment 4: Delay Discounting of Future Gains versus Losses of Time and Money

Experiments 2 and 3 studied the discounting of investments (or losses) of time and money. Most research on intertemporal choice concerns tradeoffs of positively valued outcomes at two different points in time. Moreover, Experiments 2 and 3 asked respondents to judge the number of periods of use that would equate the value of an option that was better in the long run to one that was better in the short run. The standard intertemporal choice task, on the other hand, asks respondents to *match* the value of a later outcome \(B\) to create indifference to a fixed earlier
outcome A (e.g., Thaler 1981). In Experiment 4, we demonstrate that our findings in Experiments 2 and 3 are not due to task differences from the prior literature.

Experiment 4 includes both gains and losses of time and money. Like most prior work, we measured delay discounting by the amount of time and money that respondents required to be just indifferent between a specified reward or cost in the near future and a larger, later reward or cost, the value of which is set by the respondent. The higher the number a participant assigned to the future amount, the greater the delay discounting. We manipulated whether these costs were expressed in terms of hours or a numerically tenfold dollars. Our main prediction is that the greater discounting of time than of money will generalize from losses (investments) to gains (receipts). We expected to find that people required more of the future resource to equate the value of the near and distant options when the resource was time rather than money.

This design is also relevant to testing whether the discounting behavior we have reported thus far should be interpreted in terms of temporal construal theory (Eyal, Liberman, Trope, &Walther, 2004; Liberman & Trope, 1998; Trope & Liberman, 2003) which predicts that that “low level” future costs fade in importance with temporal distance, but “high level” future gains grow in importance. Temporal construal theory can predict that an alternative with a monetary gain and a time loss would become more attractive with greater temporal distance. It is silent on why one should find time versus money differences when both are costs, but one could envision modifying the theory to take account of differences among resources in how amenable they are to concrete versus abstract representation in memory. If such a modified theory could account for our results so far, we should find in Experiment 4 that both time and money are discounted more when they are investments/costs rather than rewards/gains.
Method

Subjects and design. Respondents were 61 MBA students who volunteered to participate and received a piece of chocolate in exchange for completing the task. They were randomly assigned to one of four conditions in which immediate and future outcomes were described in terms of either time or money and as gains or losses.

Procedure. Respondents completed a questionnaire labeled “Practicum Class Requirement.” They were asked to imagine themselves in the position of a student enrolled in a small “practicum” class that meets once a week (see full details in Appendix A). Respondents were told that students take turns organizing and leading discussion and paying for food for the class. In gain conditions, respondents had been responsible for two days in the course; because a student had added the course, they could now gain time or money by dropping either the sooner or later of the assigned days. In loss conditions, respondents had been responsible for one day of the class; because two students had dropped the course, they could lose time or money by covering an additional day initially assigned to one of the two students who had dropped. In all cases, participants had to consider two alternative assignments and complete a matching task specifying of the amount needed in the future to be indifferent between the later and earlier options. There were four different versions:

In the Time / Gain condition they were told

“What amount of time savings in the last week of March would make you just indifferent between saving 4 hours of preparation this week and saving more than 4 hours in the last week of March?”

In the Money / Gain condition they were told

“What amount of money savings in the last week of March would make you just indifferent between saving $40 this week and saving more in the last week of March?”

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5 In this MBA program, a practicum class is a small, self-organized class that works on project for a business client under the supervision of a professor.
In the Time / Loss condition they were told

“What amount of time spent in the last week of March would make you just indifferent between spending 4 hours of preparation this week and spending more than 4 hours in the last week of March?”

In the Money / Loss condition they were told

“What amount of money spent in the last week of March would make you just indifferent between paying $40 this week and paying more in the last week of March?”

The dependent variable was the ratio of the participant’s larger, later matching response to the smaller, sooner amount stated in the problem. A ratio of 1 implies no discounting.

Results and Discussion

The point of this study was to test whether the time versus money differences in discounting would replicate with gains as well as losses. Delay discounting was analysed in a 2 × 2, Resource (Time vs. Money) × Domain (Gain vs. Loss), between-subjects ANOVA. As predicted, there was a significant main effect of Resource (F(1, 57) = 22.87, p < .001, \( \omega^2 = 0.234 \)), showing that, on average, people discount time (M = 1.4, SD = 0.42) more than money (M = 0.98, SD = 0.25). There was no main effect of Domain (F(1, 57) = 0.09, p = .76) or Resource x Domain interaction, F(1,57) = 2.65, p = .11.

Results are shown in Figure 2. Replicating our previous findings, in the time condition, respondents required more uses to match the attractiveness of the near and distant options compared to the condition where same problems were expressed in terms of money. We found this to hold both for gains (Time M = 1.46, SD = 0.52; Money M = 0.89, SD = 0.31), t(30) = 3.70, p < .001, \( \omega^2 = 0.284 \) and losses (Time M = 1.34, SD = 0.26; Money M = 1.06, SD = 0.14), t(27) = 3.65, p < .001, \( \omega^2 = 0.299 \). Because the variances were unequal in the two conditions, we computed a Mann-Whitney non-parametric test, yielding the same results for both gains (U = 41.0, p < .002) and losses (U = 35.5, p < .005). The directionally smaller effect in losses than in
gains implies that our findings with investments (losses) in other experiments provide a conservative test of time versus money.

Experiments 2, 3, and 4 demonstrate that people discount future time more than future money, consistent with our slack account. Experiment 4 further demonstrates that the time versus money difference in discounting holds for gains as well as losses. This result distinguishes our account from temporal construal theory which would predict greater discounting of losses than of gains. Nor did our results conform to a “sign effect” -- that gains are discounted more than losses (e.g., Shelley, 1993, 1994; Thaler, 1981).

To further explore differences in delay discounting of time and money and to examine more directly the implication of changes in slack gain on the pattern of discounting, the next experiment will test the relative temporal consistency of discounting future time versus money.

Experiment 5: Present-Biased Preferences for Time versus Money

One of the most well-established findings in the discounting literature is that discounting is “hyperbolic” or “present biased.” As discussed earlier, research in intertemporal choice indicates that people place greater weight on the short-term cost advantage of options when a decision is closer in time (Ainslie & Haslam, 1992; O’Donoghue & Rabin, 1999; Zauberman, 2003). That is, people may prefer a large cost in two days to a small cost today, but not prefer a large cost in 30 + 2 days over a small cost in 30 days.

The classic account of this phenomenon attributes it to the effect of temporal distance on the weight attached to earlier versus later utility (Loewenstein and Prelec, 1992). We would argue that one can observe a phenotypically similar result because the (dis)utility of time invested in a task changes with temporal distance, not because the weight of time-invariant utility changes with temporal distance. We assume that slack gain for time is driven by people’s
misperception that they are much busier in the near future than they will at any point in the more distant future. That is, time slack gain from time $t$ to $t+n$ should be greater when $t$ is imminent than when $t$ is distant. Any such asymmetry should be weaker for money, as suggested by Experiment 1. People will have little expectation of slack gain for money for values of $t$ associated with short and intermediate time frames such as those compared in this paper (weeks and months rather than years). Consequently, we should expect to see greater temporal inconsistency and more present-biased preferences for decisions involving time rather than money.

In Experiment 5, we endowed all subjects with a low setup cost, high ongoing cost alternative and asked them whether or not they would switch to a high setup cost, low ongoing cost alternative that was clearly better in the long run. The more people discount future (ongoing) investments, the more prone they should be to stay with their current provider. The task we used was similar to Experiments 2 and 3 where we varied whether the investments required were framed in terms of dollars or an equivalent number of minutes. Importantly, we also varied whether the decision to stay or switch was to be taken today or in one month. We hypothesized that, for time decisions, people will be less prone to switch today than when the decision is to take effect a month from now. We expected this tendency to be weaker for money than for time.

Method

Participants. Two hundred and sixty four students were assigned randomly to one of four conditions; they were each paid $2 for their participation.

Procedure. Participants were faced with a hypothetical selection of on-line providers. The scenario described a consumer who is using the online information service an average of once a
month and stated that this consumer previously used the low set-up and high usage cost option. Participants were asked to put themselves in the position of that consumer and to choose whether to stay with the low set-up cost provider or switch to the high set-up cost provider. Both providers were said to be equal in all other aspects, including offerings, prices and trustworthiness. Participants had to choose whether to switch providers or to stay, and then indicate how likely they were to do so on an 11-point scale.

**Design and Stimuli.** The experiment followed a $2 \times 2$, Temporal Distance $\times$ Resource, between-participants design. The time of the next purchase was either today (low temporal distance) or next month (high temporal distance). The resource required for investment was either time or money. The setup costs and usage costs of the two options were either time in minutes or money in dollars. The low set-up and high usage cost option consisted of a 2-minute ($2) initial set-up and a 15-minute ($15) ongoing usage cost. The high set-up and low usage cost option consisted of a 25-minute ($25) initial set-up and an 8-minute ($8) ongoing usage cost. Participants were endowed with the low set-up option by stating that they had used that provider in the past and thus would not need to incur a set-up cost. See Appendix B for complete details.

**Results**

Proportions of respondents choosing to stay or to switch are shown in Figure 3. The light bars on the right of each pair show percentage switching; dark bars on the left show the percent staying. Switching is better in the long run but not in the short run, so greater switching indicates lower levels of discounting of future investments. Using a logistic regression, we found a significant difference between time and money in the association of stay/switch with today/1 month, ($\chi^2 = 3.93$, $p = .047$, $\Phi^2 = 0.015$).\(^6\) Results for the money conditions are shown to the

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\(^6\) We also found a main effect for Resource ($\chi^2 = 8.79$, $p = .003$) and no main effect for Temporal Distance ($\chi^2 = .43$, $p = .51$). Strength of preference ratings showed an identical pattern of effects.
right of Figure 1; using a $2 \times 2 \chi^2$ analysis, we see no reliable difference in percentage switching today (69.7%) versus in one month (62.1%), $\chi^2(1) = .84, p = .34$. In contrast, for the time condition, significantly fewer participants switched when the decision was today (39.4%) than when the decision was next month (56.1%), ($\chi^2(1) = 3.67, p = .055, \Phi^2 = 0.014$).

Discussion of Experiment 5

Replicating our previous findings, the main effect of resource type reflects a significantly stronger preference to switch for money than for time, indicating greater discounting for time than money. Experiment 5 adds to Experiment 3 in showing again that the time versus money differences in discounting cannot be explained by a magnitude effect (i.e., time values have lower utility than corresponding money values and thus are discounted at a higher rate).

Experiment 5 results show that one month into the future, participants’ switching rates are virtually identical for time and for money, ($\chi^2(1) = 0.50, p = .48$). However, when those same investments were required today, there was a time versus money asymmetry ($\chi^2(1) = 12.22, p < .001, \Phi^2 = 0.046$). If one argues that time was discounted more than money today due to a magnitude effect (time units less valuable than money units), one would have to explain why we did not observe a parallel time-money difference when investments did not begin for a month.

The key point of Experiment 5, though, is that participants show more pronounced present-biased preferences for time than for money. Our explanation for this finding is in terms of patterns of growth in slack over the time periods being compared in a decision. By our account, people think that they are unusually busy in the immediate future but will become less busy shortly, so that any two points in the mid-term future look similar in degree of slack. For money, people do not think that they are unusually cash-constrained in the immediate future or that their
money slack will change dramatically in the future. Experiment 6 tests this hypothesis.

Experiment 6: “Hyperbolic” Slack Gain for Time versus Money and Slack Predictability

Method

Subjects. Respondents were 48 undergraduate students who participated in both waves of a two-wave study, with the two sessions separated by three weeks. Seventy student participants completed the first part, 19 participants did not complete the second part, and three respondents who completed the first part completed only a portion of the second part and were excluded.

Design. The design was a 2 × 2, Temporal Distance × Resource, completely within subjects design. Temporal Distance was either Far (ratings on March 16th) or Near (ratings on April 6th). Resource was either Time or Money.

Procedure. This experiment included two sessions. The first session was on March 16th and the second session was on April 6th. Each session included elicitation of the slack measures and was very similar to that in Experiment 1. Respondents received a two-page questionnaire measuring time slack gain and money slack gain. One side of the page, labeled “Thinking about Schedules,” and the page was labeled “Thinking about Budgets.” Order of the two pages was counterbalanced and again had no effect (F(1, 44) = .54, p = .47 for first test period, and (F(1, 44) = .001, p = .98 for second test period). On the first session, March 16th, we asked for time:

“Think about your specific activities today (Tuesday, March 16th) and your available spare time. Now consider your likely specific activities and available spare time for two days, three weeks from now: Tuesday, April 6th and Thursday, April 8th.”

The other page, labeled “Thinking about Budgets”, asked:

“Think about your specific expenses today (Tuesday, March 16th) and your available spare money. Now consider your likely specific expenses and available spare money for two days,
three weeks from now: Tuesday, April 6th and Thursday, April 8th.”

The second session took place on April 6th. We asked:

“Think about your specific activities today (Tuesday, April 6th) and your available spare time. Now consider your likely specific activities and available spare time for Thursday, April 8th, two days from now.”

The other page, labeled “Thinking about Budgets”, asked:

“Think about your specific expenses today (Tuesday, April 6th) and your available spare money. Now consider your likely specific expenses and available spare money for Thursday, April 8th, two days from now.”

For each of the two time periods, participants rated time and money slack. For Time, participants were asked “On the following scale, please circle a number that reflects how much available spare time you have” and circled a response on a scale anchored -5 (very little available time) and 5 (lots of available time). For Money, participants were asked “On the following scale, please circle a number that reflects how much available spare money you have” and responded on scale anchored at -5 (very little available money) and 5 (lots of available money).

The key dependent variable was the “slack gain” score. For each participant, we computed (Time Slack on April 8th – Time Slack on April 6th) and (Money Slack on April 8th – Money Slack on April 6th). These slack gain measures can range from +10 (much more slack available on April 8th than on April 6th) to -10 (much less slack available on April 8th than on April 6th).

Results and Discussion

Present-biased slack gain. “Hyperbolic” or “present-biased” slack gain would be evident if people perceived that the gain in a resource on day t+2 compared to day t increases as t draws nearer. We expected that, when viewed from a distance of three weeks, people would perceive

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8 We thank an anonymous reviewer for suggesting this experiment.
little gain in slack moving from April 6th to April 8th. But when slack was rated on April 6th, we expected people to rate themselves as busier today than in two days. We expected that this pattern would be stronger for time than for money.

That is what we found, as shown in Figure 4. The repeated measures ANOVA revealed a marginally significant resource by temporal distance interaction ($F(1,47) = 3.62$, $p = .063$, $\omega^2 = 0.052$), in addition to a significant main effect of resource ($F(1,47) = 7.49$, $p = .009$, $\omega^2 = 0.119$) and a marginally significant main effect of temporal distance ($F(1,47) = 3.42$, $p = .070$, $\omega^2 = 0.048$). People expected more slack gain from April 6th to April 8th when viewed from a near than from a far temporal distance, but this simple effect was significant only for time ($F(1, 47) = 5.11$, $p = .028$, $\omega^2 = 0.079$) and not for money ($F(1,47) = 0.01$, $p = .92$). For money, slack gain from April 6 to April 8 did not differ significantly from zero either when rated on March 16th ($M = -.21$, $SD = 1.24$, $t(47) = -1.17$, $p = .249$) or on April 6th ($M = -0.23$, $SD = 2.05$, $t(47) = 0.77$, $p = .444$). For time, slack gain from April 6th to April 8th did not differ from zero when rated on March 16th ($M = 0.19$, $SD = 1.04$, $t(47) = 1.24$, $p = .220$); but when rated on April 6th, people expected to have significantly more time available on April 8th than on April 6th, ($M = 1.00$, $SD = 2.65$, $t(47) = 2.61$, $p = 0.012$, $\omega^2 = 0.108$).

*Predictability of Slack for Time and for Money.* We argue that these patterns of “hyperbolic” slack gain explain why we found “hyperbolic” discounting for time but not for money. People understand that they are no more cash constrained today than they will be in the near future. However, they maintain the illusion that today is especially busy.

A reader might wonder why people do not learn that, if they are busy today, they will be equally busy in two days. One may also ask why consumers seem to understand that money demands will be similar in two days as they are today. One reason is that slack gain for time is
often less predictable than slack gain for money. For money, people think that their slack for one day is similar to slack for any other day; this is not the case for time. We posit that these differences in predictability are caused by the greater irregularity across periods in how time is spent in comparison with how money is spent and the greater fungibility of money compared to time. Therefore, we expected to see that money slack in two days is correlated with money slack today, but that time slack in two days is less highly correlated with time slack today.

Our results supported this expectation. Viewed from a distance of three weeks (March 16th), money slack was rated to be very similar on April 6th and April 8th (r = .91, p < .0001); time slack also appeared similar on the two days (r = .91, p < .0001). But when April 6th arrived, money slack on the 6th and April 8th still looked quite similar (r = .73, p < .0001), but time slack on the 6th was relatively less similar to time slack on the 8th (r = .52, p = .0002). Using Steiger’s (1980) test of the difference between two dependent correlations, this time/money difference is marginally significant (Z = 1.68, p = .094).

Similarly, gains (or losses) in slack between April 6th and April 8th as perceived on April 6th are more predictable from estimates of the same quantities on March 16th for money. For each respondent, we calculated the absolute difference between the slack gain (April 8th – April 6th) as rated at two points in time: March 16th and April 6th. Results showed that this absolute difference is significantly greater for time (M = 1.85, SD = 1.83) than for money (M = 1.10, SD = 1.24), F(1,47) = 6.38, p = .015, $\omega^2 = 0.101$.

This finding implies that, on April 6th, the difference in time slack between that day and two days later is a surprise to participants – in the sense of being unpredictable three weeks earlier; the difference in money slack between that day and two days later is comparatively less surprising on April 6th. This interpretation is consistent with our argument that people are
consistently surprised to be so busy today, leading them to perceive that time slack will become more abundant in the very near future. People are less able to anticipate changes in competition for their time than they are to anticipate changes in competition for their money.

Up to this point, we have shown evidence of greater delay discounting for time than for money (Experiments 2, 3, and 4) and greater evidence of “hyperbolic” discounting for time than for money (Experiment 5). Further, we have shown that expectations about gains in slack are fully consistent with our slack account of delay discounting (Experiments 1 and 6). However, we have not yet shown that relative future slack for time and for money predicts delay discounting. Experiment 7 investigates this directly.

Experiment 7: Propensity to Delay as a Function of Future Slack Gain for Time and Money

In Experiment 7, we tested whether measured time slack gain and money slack gain can account for time versus money differences in revealed preference to delay investments. We measured slack for time and for money on two days: tomorrow, and two weeks from now, then computed for each subject time slack gain (time slack in two weeks – time slack tomorrow) and money slack gain (money slack in two weeks – money slack tomorrow). After an unrelated task, subjects were asked about their willingness to contribute to each of two similar, real local charities. The descriptions of the charities, their plights, and the help requested of the respondent were quite detailed, but the charities differed in whether the help was required tomorrow or two weeks from today. We measured preference to delay as the difference in rated intention to help in two weeks versus tomorrow. The key manipulated variable was whether the help being solicited was a donation of time or money.

We expected the analysis of time slack gain and money slack gain measures to replicate Experiment 1 – that is, greater time slack in two weeks than tomorrow, with this tendency being
reduced for money. We wanted to assess the replicability of our finding from Experiment 6 that time slack is less predictable than money slack. Therefore, we expected to see that money slack in two weeks is correlated with money slack tomorrow, but that time slack in two weeks is not highly correlated with time slack tomorrow.

The most critical aims of Experiment 7, though, were twofold:

a. to examine whether time or money charitable appeals elicit more preference to delay helping;
b. to test whether time versus money differences in preference to delay are explainable by the relative magnitudes of anticipated slack gains for time and for money.

We hypothesized that people would, on average, anticipate more slack gain for time than for money, but that they would demonstrate greater discounting of time versus money if and only if this condition holds. When people expect equivalent slack gain for time and for money, they should show equivalent preference to delay time versus money investments. And when people expect greater slack gain for money than for time, they should show greater preference to delay investment for money than for time.

Method

Subjects. One hundred and thirty undergraduate students participated in partial fulfillment of a class requirement.

Procedure. Respondents reported in groups of 8 to 12 for one-hour sessions that involved several tasks. The tasks were presented as unrelated projects by different investigators. The first task was another researcher’s unrelated study in which respondents rated pens they had been using over the past two weeks.

Second, respondents received a packet of questionnaires to be completed at their own pace. Included in this packet were our measures of slack. Respondents were asked to rate their
available time and money slack tomorrow and in two weeks, allowing us to compute time slack gain and money slack gain for each respondent.

Third, as the filler task, respondents completed a set of unrelated tasks for 20-minutes, including evaluations of various scenarios and a task that involved solving complex puzzles.

Fourth, respondents were asked to rate their likelihood of assisting each of two local children’s charities, the Boys and Girls Club of Durham, and Big Brothers and Big Sisters of Durham and Orange Counties. One of these charities requested help tomorrow and the other in two weeks. We measured preference to delay as the difference in intent to help in two weeks versus tomorrow. We counterbalanced which charity made the delayed appeal. We also manipulated between subjects whether both charities were asking for help in the form of volunteered time or donated money.

In post-experimental debriefing, subjects were asked whether they saw any connection between the studies. None connected our tasks occurring in the 2nd and 4th phases of the session.

**Measurement of time slack gain and money slack gain.** Time slack and money slack were measured in the second phase of the overall procedure for two dates: tomorrow and two weeks from today. From these measures, we computed *Time Slack Gain* as the difference between time availability in two weeks minus availability tomorrow. We computed *Money Slack Gain* in the same way. Both measures range from −10 to +10, with positive numbers indicating more time (or money) in two weeks than tomorrow.

The focal analyses to be reported use the *difference* between time slack gain and money slack gain to account for time-money differences in discounting. The measured independent variable (Time Slack Gain – Money Slack Gain) ranges from -20 to +20.
Stimulus materials for charity study measuring preference to delay. Stimulus materials describing the Boys and Girls Club of Durham and Big Brothers and Sisters of Durham and Orange Counties were edited versions of similar stories taken from newspaper stories and web sites. Each story included several paragraphs describing the charity and detailing what it did for children, who the affected children were, and what the evidence was of its value. These materials were identical for all respondents. At the bottom of the page for each charity was a section entitled “How can you help?” The nature of the help requested was manipulated between subjects. In the Time Resource condition, the two appeals asked respondents to volunteer their own time. In the Money Resource condition, the appeals asked for a specified monetary donation. Appeals for the Money Resource condition are shown below. See Appendix C for complete details.

(Boys and Girls Club) “A fund drive is being spearheaded at UNC two weeks from today, asking for students to make a $20 donation to the Boys and Girls Club of Durham at the Kenan-Flagler Business School.”

(Big Brothers and Big Sisters) “The current need of the Durham and Orange County Big Brothers and Sisters is for financial support for its major annual fundraising event, Bowl for Kids’ Sake. We are requesting that students at UNC make a $15 donation, to be collected at the Kenan-Flagler Business School, tomorrow.” In the Time condition, the introductory several paragraphs were the same as in the Money condition, but in the “How can you help” sections at the bottom of the page, the requests were for time and not money:

(Boys and Girls Club) “Students from UNC are asked to help by volunteering at the Boys and Girls Club in Durham for two hours, in the afternoon or evening two weeks from today. (Rides can be provided from the Kenan-Flagler Business School.)”
(Big Brothers and Big Sisters) “The current need of the Durham and Orange County Big Brothers and Sisters is for financial support for the Bowl for Kids’ Sake fundraiser. We are requesting that students at UNC sign up to staff a fund-raising table at a Chapel Hill shopping mall for a one and one-half hour time block tomorrow. Transportation will be provided from the Kenan-Flagler Business School.”

After each request, respondents were asked to rate how likely they were to help in the specified way on the specified day on a scale from 1 (very unlikely) to 7 (very likely). They were told that their responses were private and non-binding. Subsequently, subjects were asked in a forced choice which of the two charities they would help if they could assist only one. The latter dependent variable showed no reliable effects and will not be discussed below.

*Design.* The key dependent variable was Preference to Delay, computed as the difference in rated likelihood of helping the charity needing assistance in two weeks minus likelihood of helping the charity needing assistance tomorrow. Since each element of this difference could range from 1 to 7, this difference score ranged from +6 to −6. More positive numbers indicate a stronger preference to help in two weeks versus tomorrow.

There were three independent variables, two manipulated and one measured. We counterbalanced whether the delayed charity was Boys and Girls Club or Big Brothers and Big Sisters. This between-subjects factor had no effects in any of the analyses we conducted so we drop it from the analyses reported below. Resource (Time vs. Money) was manipulated between subjects. The final independent variable was the measured difference between expected future gains in slack of time versus money. This difference (Time Slack Gain − Money Slack Gain) ranges from +20 to −20. It is positive when time slack is growing faster than money slack and negative when the opposite is true.
Results

We first present analyses of the slack measures, testing whether subjects expect time slack to grow faster than money slack. Following this, we present analyses showing how preferences to delay investment differ for donations of time versus money as a function of the degree to which time slack gain in the future exceeds money slack gain. We expect to find greater preferences for time than for money only for individuals expecting time slack to grow faster than money slack.

Analyses of measures of perceived slack. Perceived slack gain measures were analyzed as a 2 x 2 ANOVA in which Resource was a repeated factor and order of questions (Time, Money or Money, Time) was a between subjects counterbalancing factor that had no effects (F(1, 128) = .66, p = .419). Averaging across time and money, the mean gain score was significantly positive (F(1,128) = 12.73, p = .0005, \(\omega^2 = 0.083\)); on average, people perceived more slack in two weeks than tomorrow.

Critical to our slack gain account, was a Resource effect on slack gain scores. Slack gain from tomorrow to two weeks was more positive for time (M = 1.2, SD = 4.03, than for money (M = 0.27, SD = 2.64), F(1,128) = 4.82, p = .03, \(\omega^2 = 0.029\), replicating Experiment 1. For money, slack gain did not differ from zero (F(1,128) = 1.41, p = .24); for time, the gain in slack from tomorrow to two weeks was significantly positive (F(1,128) = 11.74, p = .0008, \(\omega^2 = 0.076\)).

We reason that time slack is perceived to grow in the future compared to money slack in part because time slack is perceived to be less stable than money slack. To test this hypothesis, we correlated the measures of time and money slack for tomorrow and for two weeks. As expected, for Money Slack, the correlation between slack tomorrow and in two weeks was
reliable (r = .45, p < .0001). For Time Slack, there was no correlation of slack tomorrow and in two weeks (r = .03, p = .72).

*Analyses of Preference to Delay.* Our resource slack hypothesis implies that Preference to Delay will only be stronger for time than for money when Time Slack Gain is greater than Money Slack Gain. People will discount future time investments more than future money investments only when time slack is expected to grow at a faster rate than is money slack. When Time Slack Gain equals Money Slack Gain, there should be no difference in preference to delay. When Time Slack Gain is less than Money Slack Gain, we should observe more preference to delay for money than for time, reversing the pattern of Experiments 2, 3, 4, and 5 that discounting is greater for time than for money.

Recall that Preference to Delay is a difference score computed as the rated intention to help in two weeks minus intention to help tomorrow. Since each element of this difference could range from 1 to 7, this difference score ranged from +6 to –6. More positive numbers indicate a stronger preference to help in two weeks versus tomorrow.

Relative Slack Gain is the difference score (Time Slack Gain – Money Slack Gain), ranging from +20 to –20. It is positive when time slack is growing faster (or shrinking more slowly) than money slack and negative when the opposite is true. This measure is positive on average (M = 0.91), but there is considerable heterogeneity (SD = 4.88), allowing us to test how the simple effect of time versus money (Resource) depends on whether (Time Slack Gain – Money Slack Gain) is positive, zero, or negative.

The key analysis splits subjects into groups depending on their values of (Time Slack Gain – Money Slack Gain). We treated this blocking factor as an independent variable in a Resource (Time / Money) × Slack Gain Block ANOVA. We divided subjects into those expecting time
slack to be growing faster than money slack (Time Slack Gain – Money Slack Gain > 1, n = 59), those expecting time and money slack to grow at roughly equal rates (-1 ≤ Time Slack Gain – Money Slack Gain ≤ 1, n = 34), and those expecting money slack to grow faster than time slack (Time Slack Gain – Money Slack Gain < -1, n = 37). Preference to Delay exhibited a significant Resource × Slack Gain Block interaction, F(2,124) = 5.53, p = .005, ω² = 0.065. Follow-up tests showed that when Time Slack Gain – Money Slack Gain was high – that is, people expected time slack to grow at a faster rate than money slack -- preference to delay was stronger for investments of time (M = 1.1) than of money (M = 0.1), t(124) = 2.31, p = .023, ω² = 0.032. When Time Slack Gain – Money Slack Gain roughly equaled 0, preference to delay was not significantly different for time (M = 0.7) than for money (M = 0.0), t(124) = 1.27, p = .21. When Time Slack Gain – Money Slack Gain was low, preference to delay was stronger for investments of Money (M = 1.4) than of Time (M = 0.1), t(124) = 2.22, p = .028, ω² = 0.029.

The blocking approach above is more conventional, but a statistically superior version of the analysis above treats (Time Slack Gain – Money Slack Gain) as a continuous variable, rather than splitting subjects into groups (Aiken and West, 1991; MacCallum, Zhang, Preacher, and Rucker, 2002). We therefore regressed Preference to Delay on a dummy variable for Resource (Time vs. Money donations requested), the continuous measure of (Time Slack Gain – Money Slack Gain), and the interaction of Resource x (Time Slack Gain – Money Slack Gain). The interaction was significant, F(1,126) = 9.16, p = .003, ω² = 0.059. The pattern of the interaction can be seen in Figure 5, which shows the forecast of the OLS regression model:

Figure 5 shows how preference to delay differs for time versus money investments when time slack is growing more, equally, or less quickly than money slack. We followed up this interaction with tests of the simple effect of Time versus Money Resource when (Time Slack Gain – Money Slack Gain) is positive, zero, and negative. We used the methods described by Aiken and West (1991) and Irwin and McClelland (2001) for testing simple effects of a categorical variable at different levels of a continuous variable.

When Time Slack Gain – Money Slack Gain was 1.5 standard deviations above 0, predicted preference for delay was 1.42 scale points higher for time than for money, t(126) = 2.92, p = .004, $\omega^2 = 0.055$. However, when Time Slack Gain – Money Slack Gain equaled 0 -- that is, when expectations about future growth in time slack are matched by expectations of future growth in money slack -- there was no significant time versus money difference in predicted preference to delay, t(126) = -.0.24, p = .81. Finally, when Time Slack Gain – Money Slack Gain was 1.5 standard deviations below zero -- that is, when people expected slack to grow more in the future for money than for time -- predicted preference for delay was 1.28 scale points greater for money than for time, t(126) = 2.19, p =.03, $\omega^2 = 0.028$. These findings provide strong support for our resource slack theory of time versus money differences in delay discounting.

Discussion of Experiment 7

*Rates of slack gain or loss explain time versus money differences in delay discounting.* The results from Experiment 7 replicated the findings from Experiments 1 and 6 that, on average, people expect to have more time slack in the future than they have in the present (i.e., they expect slack gain in the future). We had proposed that similar beliefs underpinned our findings in Experiments 2, 3, 4, and 5 that people discount time investments more on average than money investments. The findings from Experiment 7 directly support this interpretation.
Strong evidence that an effect is due to a particular cause is to show that the effect is present when the cause is present, but that the effect goes away when the cause is absent. We showed in Experiment 7 that, for people who have “typical” expectations that time slack will grow more in the future than will money slack, time is discounted more than money. On the other hand, if there is no difference in expected growth in slack over time, there is no simple effect of time versus money on discounting as measured by preference to delay investment. Moreover, when people have the opposite expectations, that money slack will be growing more than time slack, future money investments are discounted more than future time investments. This is important since it demonstrates that the resource dependency we observed in Experiments 2, 3, 4, and 5 are explainable by changes in slack.

One objection to our findings is that they are driven entirely by the effect of time slack tomorrow. Put simply, this critique says that our results merely show that people do not want to make time commitments on short notice. By this account, if one has a full schedule tomorrow, one may be unable to reschedule events to allow volunteering for a charity tomorrow. The same activity might be accommodated into a full schedule two weeks from now because there is time to reschedule conflicting activities. In contrast, having little money on hand is not a barrier to making a donation, because one can always borrow or use credit to cover the expense.

However, our results cannot be explained by mere knowledge of time slack today. Analyses detailed in Appendix D show that it is not just time slack tomorrow that is driving the interaction in Figure 5. If we substitute Time Slack Tomorrow for the difference (Time Slack Gain – Money Slack Gain) in our moderated regression model, model fit declines significantly. Holding constant time slack tomorrow, it is the gain or loss in slack in two weeks that dictates whether one prefers to delay time investments. Moreover the relative preference to delay for
money (vs. time) is also affected by the degree of slack gain for money compared to slack gain for time.

Is it an illusion to expect to have more time slack in the future? Is it really an error to think that one will be less busy in the future than in the present? Arguably, given lead time, one can rearrange one’s schedule to allow any new commitment to be undertaken without pain of failing to attain competing goals requiring one’s time. With short notice, it is not possible to reschedule, and thus one really does always have less slack in the short run than in the long run.

To test this possibility more directly, we conducted a simple natural experiment in which students in a class were asked about their interest in an optional session on ethnographic and observational methods in market research. Because the room available for the session would hold only about a third of the 178 class members, the session was made by invitation only, via an email sent to students one week before the session was to be held.

Students received one of two versions of the email invitation. Some students were Specifically-Forewarned about the time and place of the event the following week and some were Generally-Forewarned. The latter students were told that the event would be held the following week but that the time and place would be settled later. To minimize the likelihood of communication, students received the same invitation as other members of the teams to which they had been assigned for cases in the class, and teams were randomly assigned to the Specifically-Forewarned (n = 97) and Generally-Forewarned (n = 81) groups. Those generally forewarned were told of the exact day and time of the session with less than 24 hours notice.

On the night before the scheduled session, an email invitation was sent to the entire class announcing the opportunity to attend and the specific time. We compared the Specifically-

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9 Thanks to Sandra Jones for offering this critique.
Forewarned and Generally-Forewarned groups in their likelihood to reply to the initial email invitation, to express interest in attending in response to this invitation, and to attend the session.

Results showed no differences between the group forewarned of the specific time and the group forewarned only that the session would be held the following week. The Specific and General Forewarning groups did not differ in the rates at which they replied to the email invitation (52% vs. 44%, $\chi^2 (1) = 1.00, p = .32$), expressed interest in attending in an email reply to the invitation (44% vs. 41%, $\chi^2 (1) = 0.19, p = .67$), or actually attended the session (19% vs. 18%, $\chi^2 (1) = 0.03, p = .86$).

If the Generally-Forewarned group found it painful to reschedule conflicting commitments on 24-hour notice, one might expect that, among attendees, slack would be greater for those Specifically-Forewarned respondents. We asked attendees to rate “How busy were you today – i.e., how easy or difficult was it for you to fit this optional session into your schedule today given your other competing activities?” The rating was on a scale from -5 (very difficult to fit) to +5 (very easy to fit). The session was rated as slightly but not significantly easier to fit in for the Specifically-Forewarned group ($M = 1.47$, $SD = 2.65$, $n = 17$) than for the Generally-Forewarned group ($M = 0.93$, $SD = 2.66$, $n = 15$), $t(30) = -0.57, p = .57$. Thus, it does not appear from any of the results that people “plan for pain.” That is, they do not appear to do anything different when given specific notice about the time parameters of an activity in the future, nor do they really experience less pain than those who undertake the activity at the last minute.

Any time an experiment supports the null hypothesis, one can always explain the results by low power. Our findings above are therefore not definitive. However, they do not support the view that the time slack perceptions reported in Experiments 1, 6, and 7 were veridical rather than biased. Taken in the context of the other experiments, it appears that people scheduling an
activity in the distant future ultimately experience just as much pain as those scheduling on short notice; ironically, when they schedule far in advance, they expect the costs incurred to undertake the activity will be less in the future than in the present because they will be less busy.

At the beginning of this article, we noted that people often commit to decisions in advance that they later regret when it comes time to fulfill the commitment. Similarly, Soman (1998) found that people were more likely to choose an alternative with a rebate that required effort to redeem when it could not be redeemed immediately; however, when the time came to redeem, many did not follow through. In our natural experiment, over half of those expressing an intention to attend did not follow thorough, implying that they would have felt regret at their decisions had their expressions of intent to attend been binding.

General Discussion

The seven experiments presented here demonstrate that time and money produce different propensities to discount delayed outcomes as well as differential stability in intertemporal choice. Experiments 2, 3, 4, and 5 show that delayed time is typically discounted faster than money. Experiment 5 also shows more temporal-inconsistency and bias towards the present — that is, greater preference to delay when the decision is to be made now rather than in the future — for time than for money. We explain these phenomena by respondents’ expectations that time slack will be more abundant in the future than it is now, but that money slack will not exhibit similar expectation of gain in the future, as demonstrated in Experiments 1, 6, and 7.

Experiment 7 directly connected expected slack gain to delay discounting. We observe greater delay discounting of time than of money under conditions when time slack was expected to grow faster in the future than is money slack. But our general slack gain theory of delay discounting implies that we should be able to find reversals of the modal patterns. Experiment 7
shows that when time and money slack gains are equivalent, propensity to delay is equivalent, and when time slack gain is less than money slack gain, people delay money investments more than time investments. The implication of this framework is that negative delay discounting for time can be observed when people expect time slack to be greater in the present than in the future. Similarly, reversals could occur for people who are highly cash constrained in the present but not in the future, for example, a second-year MBA student headed for a lucrative job.

Why do people continue to labor under the illusion that they will have more time in the future than they do today? A time investment that feels too painful to make today will feel more painful than expected when it ultimately arrives. Why does this irrational exuberance about growth in time slack not translate to a parallel illusion that money will be more plentiful in the future than it is today? Others have argued that time is less fungible than money (e.g., Leclerc et al., 1995). We believe that this fungibility of money smoothes out unusual imbalances between supply and demand of money slack, making future slack more predictable for money than for time. We have presented evidence that money slack is more predictable than time slack. Below we discuss the roles of predictability and fungibility more fully. We follow with conjecture about the (as yet unstudied) role of goals in discounting and perceptions of slack.

Predictability

Time demands are generally less predictable than money demands. In experiment 7, we found that perceived slack for money tomorrow was correlated with money slack in two weeks, but perceived slack for time tomorrow was unrelated to perceived slack in two weeks. We observed overall greater variance in the time conditions than in the money conditions. Also, time slack gain is less predictable than money slack gain between two days. In Experiment 6, respondents were accurate at anticipating three weeks in advance the differences in money slack
between two days. They were significantly less accurate in anticipating the differences in time slack between the same two days.

We suggest that it is difficult to learn from feedback that time is not more abundant in the future because of the irregular ways in which we spend our time. While many of us may perceive ourselves to be quite busy almost every day of our lives, the specific activities vary from day to day. Even the total demands vary in ways that make it very difficult to predict with any confidence what will be the real costs of time investments in the more distant future. Consequently, we do not learn from feedback that, in aggregate, total demands are highly similar. This is similar to the account of the “planning fallacy” that people underestimate task completion times because they ignore base rates (Buehler et al., 1994). People perceive that past longer completion times were due to unique (ungeneralizable) situational constraints. By extension, we suggest that people are bad at learning that future time slack is no greater than present slack because they perceive that activities that compete for their time today are irrelevant to those that will compete in the future.

Resource Fungibility

Money is more fungible than time (Leclerc et al., 1995), and we infer that this contributes to its greater predictability. Money is, by its nature, fungible, at least for those with ability and willingness to save and to access credit. If one has a spike in demand for money today, one can borrow from the future (e.g., by using a credit card). Similarly, if one anticipates an unusual demand on money in two months time, they can save to meet the demand or borrow when the spike arises. The effect of this is to make slack pools smoother and more equal over time. We believe that this smoothing plays a role in our finding that people expect relatively similar levels
of money slack now as in the future. This implies that people without access to credit would be likely to show higher levels of discounting of future money.

Unlike money, time is perhaps fungible in the future, but not in the present. If offered a prospect requiring time investment in the distant future, it is possible to move around appointments, do work in advance that would have conflicted, and create a situation in which accepting the prospect does not (seem to) offer much pain. It is for this reason that it is so easy to persuade us to give talks at other schools, write tenure letters, serve on committees, comment on each others’ papers, etc., when requests are made far in advance. But in the immediate future, time is much less fungible. That is, it is more difficult to accept a prospect requiring investment now than in the future without experiencing pain from inability to complete other planned tasks. This is true for purely logistical reasons; intriguingly, it may also be true because people have active goals for their immediate activities that make it feel painful today to deny oneself the pleasure of completing these salient tasks. We elaborate on this possible role of goals below.

Goal-Setting for Time and Money

We posit that people are more likely to have goals for that day about how to spend their time than to have goals for that day regarding how to spend their money. If goals for competing uses of a resource are both more likely and more proximate in the immediate future than in the more distant future, this would produce perceptions of lower slack in the immediate future and consequent high rates of delay discounting for that resource.

In an insightful paper on “goals as reference points,” Heath, Larrick, and Wu (1999) explain how many of the standard results on goal-setting can be explained in terms of self-set goals becoming reference points, as in prospect theory (Kahneman & Tversky, 1979). In the prospect theory value function, falling short of a goal by X is more painful than exceeding a goal
by X feels pleasurable. Moreover, the steepest part of the value function is just below the reference point created by the goal. Thus, goals as reference points can explain standard findings such as that goal to sell 120 units in a year lead to lower performance than setting a goal to sell 10 units per month. Motivation is strongest when one is just short of a goal (Miller, 1944).

By this account, slack is about whether accepting an offer requiring investment today might cause one to fail to attain proximate goals on other dimensions and to experience pain from that shortfall. It is this pain -- and not the sheer amount of resource demand now versus in the future -- that produces preference to delay investment.

Now add to the argument above the premise that people have articulated goals for time (spend four hours to accomplish B today) but not for money (spend $X on B today). If so, one might predict more delay discounting of time than money, as we observed here. The goal-setting account suggests that we should observe reversals of our “default” finding for people who are careful budgeters in the current period but not prone to setting goals for how to spend their time.

A Cognitive Account of “Impulsiveness” in Utilitarian Domains

“Hyperbolic” or “present-biased” discounting has been interpreted as evidence of impulsiveness – either the province of impulsive individuals (e.g., Baker et al., 2003) or of behavior influenced by “visceral” stimuli (Ainslie and Haslam, 1992; Loewenstein, 1996; Shiv and Fedhorikhin, 1999). Animals display similar present-biased discounting (Ainslie, 1974). Our results from Experiments 5 and 6 show that this “present-biased” behavior can occur for very utilitarian motives based on cognitive perceptions of slack.

Obviously, our slack theory cannot account for all instances of hyperbolic discounting such as discounting by animals or discounting of addictive or visceral stimuli. But neither can our results be anticipated by the accounts presented to date in the literature. Delay discounting
seems to be like other multiply-determined behavioral decision phenomena in that evidence for
cognitive underpinnings co-exists with evidence showing similar behavior by lower animals. For
example, Simonson (1989) showed that the asymmetric dominance effect grows stronger when
one needs to give reasons for one’s choices, but the asymmetric dominance effect is observed for
birds and bees (e.g., Shafir, Waite, & Smith, 2002).

Our results on slack and hyperbolic discounting are important for three reasons. First, we
are able to show hyperbolic discounting based on purely cognitive perceptions of slack. Our
slack theory is compatible with other cognitive accounts of present-biased preferences.
Rubenstein (2003) invokes Tversky’s (1977) similarity model to argue that results that were
interpreted as hyperbolic discounting can be explained by changes in “similarity” between two
events the closer they are in time. We show in Experiments 5 and 6 that it is similarity in slack
that changes over time and leads to behavior that can be interpreted as hyperbolic discounting.

Second, we show that one need not invoke changes in pure time preferences to explain
intertemporal preferences of the sort associated with hyperbolic discounting. Recent reviews by
Frederick et al. (2002) and Read (in press) have emphasized the importance of separating
intertemporal changes in preference due to the discount rate – to pure time preference to receive
utility earlier rather than later – from effects of temporal distance on the expected utility of
outcomes. Previous authors have attributed “hyperbolic discounting” to the weighting of future
utility as a function of its temporal distance rather than to changes in the expected utility of
consequences as a function of temporal distance (e.g., Ainslie, 1975; Loewenstein & Prelec,
1992). We are able to show that we get phenotypically similar discounting due to changes in the
utility of future events, owing to perceptions of greater opportunity costs now than in the future.
Relatedly, one need not appeal to hyperbolic pure time preferences to explain the need for self-
control devices that prevent one from choosing a smaller, sooner reward over a larger, later one when the sooner one draws close in time (Ainslie, 1975; Wertenbroch, 1998).

Our findings in Experiments 5 and 6 leave open a tantalizing question. The usual self-control problem is that people must bind themselves to preferences that they have at a temporal distance; otherwise, they cannot resist the temptation from a proximal stimulus to choose against their “long run” interests. In our work, people exhibit temporal inconsistency in their preferences for expenditures of time. But should one interpret our findings to suggest that, for investments of time, people have a self-control problem when too far from events rather than when too close? Is the problem that they have the self-control to say “no” in the present, but not when an alternative causes costs only in the future (cf. Soman, 1998)?

The anecdotes that we used to introduce this paper assumed implicitly that people are making a mistake when we agree too readily to activities in the future because we underestimate the future competition for our time. One might argue, though, that decisions taken at a temporal distance are wiser because they are more driven by our higher goals rather than by local costs (Trope and Liberman, 2003). Gilovich and Medvec (1995) reported that, in the long run, people regret inactions more than actions. In temporal construal terms, people regret that they allowed short term constraints to keep them from taking life-altering actions that would have been better for them in the long run. This perspective might lead one to conclude that we are not making a mistake when we say yes to all of those requests made long in advance to review candidates for tenure, serve on committees, or to give talks.10

Our intuition, though, is that we really are making a mistake to agree to so many activities far in advance that we would decline if temporally close. We may be glad in the long run that we agreed to coach our children’s sports teams, but most instances when we say “yes”
are not some life-enhancing opportunity that affords utility from remembrance. We may curse ourselves in the long run for saying “yes” to many small professional services that provide momentary approval from those who ask us to undertake some task, but provide no particular satisfaction in long term retrospect. This is a fascinating issue for future research on self-control.

Conclusion

The resource slack account of intertemporal choice that we have presented implies that one of our central findings -- that future time investments are discounted more steeply than future money investments -- is not completely general. This was the point of Experiment 7. Extending the argument, time may not be discounted more than money by people who have jobs with irregular wages (e.g., salespeople on commission, street performers) or by those with very regular time demands in their jobs with very little-day-to-day variation in the specific tasks required (e.g., railroad engineers, toll booth attendants, assembly line workers). However, all of these contingencies are consistent with the general conceptual framework put forth in this paper that resource differences in delay discounting and differences in how “present-biased” discounting can be explained by resource differences in perceived growth or contraction of slack.

We plan in future research to investigate directly the roles of goals, fungibility, and predictability on perceptions of whether slack will be more abundant in the future, with consequent effects on revealed delay discounting. We also plan to investigate whether time-inconsistent preferences for how we spend our time is functional or dysfunctional. When “Yes” is followed by “Damn,” does further temporal distance in remembrance make our decisions seem wiser or more foolish?

10 We thank Yaacov Trope for this suggestion.
References


Appendix A: Stimulus Materials for Experiment 4

**Practicum Class Requirement**

Thank you for helping out by participating in this brief study. The scenario below asks you to imagine yourself in a “practicum” course that meets with a professor once a week over terms 3 and 4. Please read the description of the situation carefully and vividly imagine yourself facing the decision described *today*. Indicate your response at the bottom of the page.

Please remember there are no right or wrong answers. We are only interested in your opinions.

Imagine that you are a student in a small Practicum course that meets with your professor once a week from 6-9 PM. The practicum group meets over pizza or other snacks, sometimes inviting guests with expertise related to the practicum project. The members of the class take turns in different weeks in organizing and leading discussion; they also take turns paying for food for the group. Otherwise, your life is *exactly* as it is this term.

**Time / Gain condition**

The schedule was set on the first day of class by random drawing, and you were chosen to organize and lead discussion this week and again in the last week of March. Your professor sends you an email today. She says that because two students added the class after the schedule was set, you can get out of your assignment this week or later in March. You haven’t yet started working on this week’s assignment. You had estimated that the assignment this week would take 4 hours to prepare. The assignment in the last week of March would take somewhat longer than 4 hours.
What amount of time savings in the last week of March would make you just indifferent between saving 4 hours of preparation this week and saving more than 4 hours in the last week of March? Consider your own real life circumstances in answering.

The time you indicate should make you indifferent between receiving the two options.

4 hours this week = _____ hours in last week of March.

Money / Gain condition

The schedule was set on the first day of class by random drawing, and you were chosen to pick up the bill for snacks this week and again in the last week of March. Your professor sends you an email today. She says that because two students had added the class after the schedule was set, you can get out of paying the snack bill this week or later in March. You haven’t yet paid anything for this week. You had estimated based on the number of people attending the session this week that you would spend $40. The session in the last week of March will have extra guests, so it would cost somewhat more than $40.

What amount of money savings in the last week of March would make you just indifferent between saving $40 this week and saving more in the last week of March? Consider your own real life circumstances in answering.

The amount you indicate should make you indifferent between receiving the two options.

$40 this week = $_____ in last week of March.

Time / Loss condition

The schedule was set on the first day of class by random drawing and you were initially spared from having to organize and lead discussion. Your professor sends you an email today. She says that because two students dropped the class, she needs you to organize and lead discussion either this week or in another session in the last week of March. You estimate that the assignment this
week would take 4 hours to prepare. The assignment in the last week of March would take somewhat longer than 4 hours.

What amount of time spent in the last week of March would make you just indifferent between spending 4 hours of preparation this week and spending more than 4 hours in the last week of March? Consider your own real life circumstances in answering.

The time you indicate should make you indifferent between receiving the two options.

$$4 \text{ hours this week} = \text{______ hours in last week of March.}$$

**Money / Loss condition**

The schedule was set on the first day of class by random drawing, and you were initially spared from having to pay for snacks. Your professor sends you an email today. She says that because two students dropped the class, she needs you to pay for snacks either this week or in the last week of March. You estimate based on the number of people attending the session this week would cost somewhat more than $40.

What amount of money spent in the last week of March would make you just indifferent between paying $40 this week and paying more in the last week of March? Consider your own real life circumstances in answering.

The amount you indicate should make you indifferent between receiving the two options.

$$40 \text{ this week} = \text{______ in last week of March.}$$
Appendix B: Stimulus Materials for Experiment 5

Time conditions (today and next month)

Consider the following scenario. Your task is to put yourself in a position of a consumer deciding which of two on-line information providers to use today (next month).

In this scenario each provider’s site is characterized by two central features, the initial time it takes to set up the service, and the ongoing time it takes to complete each use. Different providers differ in the time required to complete each stage. The set up time is required only once when you initialize that service and the usage time applies to every visit.

The situation: Assume that consumer X uses an information service provider once a month. X has previously used information provider A. Therefore, X will not require to complete the one time set up to initialize the service of provider A but only the on-going usage time of 15 minutes. X is now considering whether to continue to use Provider A or switch to Provider B. Provider B will require 25 minutes to initialize the service and 8 minutes each time they use it. Assume that both providers are equally reliable and provide the same overall quality of service. You are asked to put yourself in this consumer's situation and choose which of the two providers to use today (next month).

Information Provider A. To continue to use this provider will take 15 minutes per use for evaluating information and finalizing the use.

Information Provider B. To switch to this retailer requires a one time 25-minute set up stage in order to initialize the service, and 8 minutes per use to evaluate the information and finalizing the use.

Consumer X is considering which provider to use today (next month).

- If you were consumer X in this situation, which retailer would you choose? (circle one)
(A) Stay with Retailer A  (B) Switch to Retailer B

➢ How strong do you think X’s relative preference is between the two providers?  (circle a number)

<table>
<thead>
<tr>
<th>Strongly Prefers to Stay with A</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>10</th>
<th>11</th>
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</table>

**Indifferent between A and B**

Money conditions (today and next month)

Consider the following scenario. Your task is to put yourself in a position of a consumer deciding which of two on-line information providers to use today (next month).

In this scenario each provider’s site is characterized by two central features, the initial time it takes to set up the service, and the ongoing time it takes to complete each use. Different providers differ in the time required to complete each stage. The set up time is required only once when you initialize that service and the usage time applies to every visit.

The situation: Assume that consumer X uses an information service provider once a month. X has previously used information provider A. Therefore, X will not require to complete the one time set up to initialize the service of provider A but only the on-going usage time of 15 minutes. X is now considering whether to continue to use Provider A or switch to Provider B. Provider B will require 25 minutes to initialize the service and 8 minutes each time they use it. Assume that both providers are equally reliable and provide the same overall quality of service. **You are**
Resource Slack

asked to put yourself in this consumer's situation and choose which of the two providers to use today (next month).

**Information Provider A.** To continue to use this provider will take 15 minutes per use for evaluating information and finalizing the use.

**Information Provider B.** To switch to this retailer requires a one time 25-minute set up stage in order to initialize the service, and 8 minutes per use to evaluate the information and finalizing the use.

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**Consumer X is considering which provider to use today (next month).**

- If you were consumer X in this situation, which retailer would you choose? (circle one)

  (A) Stay with Retailer A  
  (B) Switch to Retailer B

- How strong do you think X’s relative preference is between the two providers? (circle a number)

  Indifferent between A and B

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<tr>
<th>Strongly Prefers to Stay with A</th>
<th>1</th>
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<td>Strongly Prefers to Switch to B</td>
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Appendix C: Stimulus Materials for Experiment 7

Boys and Girls Club of Durham

From WRAL.com. After 60 years in Durham, the Boys and Girls Club of Durham may have to call it quits. That’s because of a 27 percent budget cut from United Way. Right now the club has a little less than $200,000. Usually their budget is at least $450,000. Without help, the club may not make it through the summer.

“Hopefully we can raise the funds to keep the doors open,” executive director Emanuel Crosland said. “That would work much better than just closing the doors and not being able to function because of lack of money.” Croslan says as tough as it is coping with the financial situation, he thinks children could bear the greatest cost. Croslan said the program offers children stability and values. "That's what we teach here. Don't be influenced. Use your own mind," he said.

Nearly 90 percent of the kids come from single-parent homes. The Boys and Girls Club offers families an affordable alternative to other day care and keeps kids off the street. "It's great. I come here every day when school is out or school's in," participant David Lawson said. "It's a safe haven, a home away from home where they're protected and don't have to worry about crime" Croslan said. “What worries me right now,” Crosland said, “is if we have to close the doors it puts our kids, in a no-win situation. In that I mean there are outside influences, there re drugs, gangs, this is their safe haven."

For some children, the club is like a family. Demetrice Via says she likes all the activities. Funding cuts could close the doors at the center. Croslan says he has hope. He says he hopes individuals or corporations will send donations to help the club pull through. Croslan says
United Way wasn't able to give as much this year to groups like the Boys and Girls Club. The Triangle United Way saw their donations drop after September 11th.

The Boys and Girls Clubs of Durham provide diverse activities that meet the interest of youth. Core Programs engage young people in programs and activities with adults, peers and family members that enable them to develop self esteem and to reach their full potential. Based on physical, emotional, cultural and social needs and interest of girls and boys, and recognizing developmental principles, our Clubs offer programs and activities in the following five areas: character and leadership development; education and career development; health and life skills; the arts; and sports, fitness and recreation.

New in the past year is Saturday Academy, an education support program that assists club members with the homework and proves help in their weaker subjects with special emphasis on Reading, Writing, Math, Science and Computer Knowledge. In addition, club members will receive instruction in test-taking skills to prepare them for the End of Grade (EOG) test.

What Can You Do? (Time Condition)

Students from UNC are asked to help by volunteering at the Boys and Girls Club in Durham for two hours, in the afternoon or evening two weeks from today. (Rides can be provided from the Kenan-Flagler Business School.)

Your response will be entirely private, and you are not obliged in any way to make the contribution you indicate.
How likely are you to volunteer to help out at the Boys and Girls Club of Durham for two hours in the afternoon or evening, two weeks from today? (1 = very unlikely, 7 = very likely)

What Can You Do? (Money Condition)

A fund drive is being spearheaded at UNC two weeks from today, asking for students to make a $20 donation to the Boys and Girls Club of Durham at the Kenan-Flagler Business School.

Your response will be entirely private, and you are not obliged in any way to make the contribution you indicate.

How likely are you to make a $20 donation to the Boys and Girls Club of Durham at the Kenan-Flagler Business School, two weeks from today? (1 = very unlikely, 7 = very likely)

Big Brothers and Big Sisters of Durham and Orange Counties

Big Brothers and Sisters of Durham and Orange Counties need your help. A Big Brother or Big Sister can act as a mentor and a role model. A “Big” can show a child that, no matter how difficult things get, there is a caring adult friend there for them—someone who will listen with an uncritical ear, who will give advice if asked, and encouragement when needed, and who will help put things into perspective. Ultimately, the guidance of a Big Brother or Big Sister can help a child grow into a confident, competent, and caring individual.

How does it work? Our service matches children from primarily one-parent households with adult volunteers. The volunteers and the children come from all walks of life and from all types of communities. Agency staff carefully evaluates prospective volunteers, who usually commit to a few hours a week for about a year. Each match is based on the needs of the child and the
interests of both the child and the volunteer. Once a match is made, professional caseworkers are
there to provide advice and support to help the match grow.

Some facts... In 1992 and 1993, some 959 boys and girls, ranging in age from 10 through 16,
entered an experiment. Approximately half were matched with a Big Brother or Big Sister,
while others were assigned to a waiting list, or control group. On average, the matched children
met with their Bigs about three times a month for an average of one year. And the results?
Researchers from Public/Private Ventures* found that 18 months later, the Little Brothers and
Little Sisters were: 46% less likely to begin using illegal drugs, 27% less likely to begin using
alcohol, 52% less likely to skip school, 37% less likely to skip class, one-third less likely to hit
someone. They got along better with their families and were more confident of their
performance in schoolwork.

*P/PV, based in Philadelphia, is a national research organization with more than 18 years of
experience in studying child development and social service issues.

How can you help? (Time Condition)

The current need of the Durham and Orange County Big Brothers and Sisters is for support for
its major annual fundraising event, Bowl for Kids’ Sake. We are requesting that students at
UNC sign up to staff a fund-raising table at a Chapel Hill shopping mall for a one and one-half
hour time block, tomorrow. Transportation will be provided from the Kenan-Flagler Business
School.

Your response will be entirely private, and you are not obliged in any way to make the
contribution you indicate.
How likely are you to volunteer to staff a Bowl for Kids’ Sake fundraising table at a Chapel Hill shopping mall for a one and one-half hour time block, tomorrow? (1= very unlikely, 7 = very likely) *How can you help? (Money Condition)*

The current need of the Durham and Orange County Big Brothers and Sisters is for financial support for its major annual fundraising event, Bowl for Kids’ Sake. We are requesting that students at UNC make a $15 donation, to be collected at the Kenan-Flagler Business School, tomorrow.

Your response will be entirely private, and you are not obliged in any way to make the contribution you indicate.

How likely are you to donate $15 to the Bowl for Kids’ Sake fundraiser at the Kenan-Flagler Business School, tomorrow? (1 = very unlikely, 7 = very likely)
Appendix D: Model Comparisons Evaluating Alternatives to Slack Gain Account of Time versus Money Differences in Discount Rates in Experiment 7

This appendix reports a series of model comparisons to evaluate an alternative account of our findings in Figure 2 in Experiment 7 that says that greater discounting of time than of money is driven entirely by the effect of time slack tomorrow. The following analysis compares the unique contribution of present versus future slack of time and money. We test the competing accounts by nested model comparisons. Our base model in Figure 2 comes from estimating the regression equation:

\[
\text{Preference to Delay} = b_0 + b_1 \times \text{Resource Dummy} + b_2 \times (\text{Time Slack Gain} - \text{Money Slack Gain}) + b_3 \times \text{Resource Dummy} \times (\text{Time Slack Gain} - \text{Money Slack Gain}). \quad (\text{Eq. 2})
\]

This model constrains the weights of Time Slack Gain and Money Slack Gain to be equal in absolute value but opposite in sign. It also constrains the weights of the Resource*Time Slack Gain and Resource*Money Slack Gain to be equal in absolute value but opposite in sign. Substituting (Time Slack two weeks – Time Slack Tomorrow) for (Time Slack Gain), substituting (Money Slack two weeks – Money Slack Tomorrow) for (Money Slack Gain), distributing coefficients b2 and b3, and rearranging terms yields the alternative form:

\[
\text{Preference to Delay} = b_0 + b_1 \times \text{Time Slack Dummy} + b_2 \times (\text{Time Slack 2 Weeks} - \text{Money Slack 2 Weeks}) - b_2 \times (\text{Time Slack Tomorrow} - \text{Money Slack Tomorrow}) + b_3 \times \text{Resource Dummy} \times (\text{Time Slack 2 Weeks} - \text{Money Slack 2 Weeks}) - b_3 \times \text{Resource Dummy} \times (\text{Time Slack Tomorrow} - \text{Money Slack Tomorrow}).
\]
The alternative theory implies that the crucial interaction reflected in the coefficient $b_3$ is completely driven by Time Slack tomorrow. If so, one should be able to fit the data better by relaxing the constraint that the weight of slack tomorrow and slack in two weeks to be equal and opposite in sign:

$$\text{Preference to Delay} = \text{Preference to Delay} = b_0 + b_1 \times \text{Time Slack Dummy} + b_2 \times (\text{Time Slack 2 Weeks} - \text{Money Slack 2 Weeks}) + b_3 \times (\text{Time Slack Tomorrow} - \text{Money Slack Tomorrow}) + b_4 \times \text{Resource Dummy} \times (\text{Time Slack 2 Weeks} - \text{Money Slack 2 Weeks}) + b_5 \times \text{Resource Dummy} \times (\text{Time Slack Tomorrow} - \text{Money Slack Tomorrow}). \quad (\text{Eq. 3})$$

A model comparison test showed that Equation 3 fit no better than Equation 2, despite two more parameters, $F(2,124) = 0.08$, $p = .92$. Moreover, the coefficients in $b_4$ and $b_5$ when estimating equation 3 were significant and opposite in sign. Put differently, it is both the time versus money difference in slack tomorrow and the time versus money slack difference in two weeks that determines time versus money differences in preference to delay. It is not simply a matter of whether one has constraints tomorrow that seem to be binding given a short window of opportunity to reschedule.
Authors Note

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Figure Captions

Figure 1. Experiment 3: Preference to Delay as function of Time versus Money Resource and the Cost Structure of Time and Money (Minutes = Dollars vs. Minutes = 4 x Dollars). Preference to Delay measured as the number of uses of a high setup cost, lower per use cost option to equate its value to a low setup cost, high per use cost option.

Figure 2. Experiment 4: Ratio of Larger, Later investment required to match value of stated Smaller, Sooner Investment as function of Time versus Money Resource and the Resource Domain (Gain vs. Loss).

Figure 3. Experiment 5: Percentage staying with or switching from low setup cost provider as a function of Resource (Time vs. Money) and timing of decision (Today vs. 1-month).

Figure 4. Experiment 6: Reported slack gain for two days (April 6\textsuperscript{th} to April 8\textsuperscript{th}) as a function of Time vs. Money Resource and Temporal Distance (Far: Ratings on March 16\textsuperscript{th} vs. Near: Ratings on April 6\textsuperscript{th}).

Figure 5. Experiment 7: OLS-Estimated Preference to Delay as function of Time versus Money Resource and the difference between Time Slack Gain and Money Slack Gain.
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Note. T = Time Resource and S = Money Resource.
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\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure4}
\caption{Figure 4. Experiment 6: Reported slack gain for two days (April 6\textsuperscript{th} to April 8\textsuperscript{th}) as a function of Time vs. Money Resource and Temporal Distance (Far: Ratings on March 16\textsuperscript{th} vs. Near: Ratings on April 6\textsuperscript{th}).}
\end{figure}

\textit{Note.} The dependent measure Slack Gain = Slack April 8\textsuperscript{th} – Slack April 6\textsuperscript{th}. 

\begin{table}
\centering
\begin{tabular}{|c|c|}
\hline
\textbf{Time} & \textbf{Money} \\
\hline
-1.00 & -0.21 \\
-0.50 & -0.23 \\
0.00 & 0.19 \\
0.50 & 1.00 \\
1.00 & 1.00 \\
1.50 & \\
\hline
\end{tabular}
\caption{Table 4. Experiment 6: Reported slack gain for two days (April 6\textsuperscript{th} to April 8\textsuperscript{th}) as a function of Time vs. Money Resource and Temporal Distance (Far: Ratings on March 16\textsuperscript{th} vs. Near: Ratings on April 6\textsuperscript{th}).}
\end{table}
Figure 5. Experiment 7: OLS-Estimated Preference to Delay as function of Time versus Money Resource and the difference between Time Slack Gain and Money Slack Gain.

Note. Adjacent symbols on each Resource curve are 0.5 standard deviations apart from each other on the variable (Time Slack Gain – Money Slack Gain). Preference to Delay is the difference in rated intention to help in two weeks and intention to help tomorrow. Time Slack Gain is (Time Slack in 2 Weeks – Time Slack Tomorrow), and Money Slack Gain is (Money Slack 2 Weeks – Money Slack Tomorrow). When (Time Slack Gain – Money Slack Gain) > 0, people expect more future growth in time slack than in money slack. When (Time Slack Gain – Money Slack Gain) < 0, people expect more future growth in money slack than in time slack.