Waiting Time and Decision Making:
Is Time like Money?

FRANCE LECLERC
BERND H. SCHMITT
LAURETTE DUBÉ*

Time is a resource. As such, consumers have to make decisions regarding their use of time in the purchase and consumption of goods and services. Using prospect theory and mental accounting as theoretical frameworks, this article investigates whether consumers treat time like money when they make decisions. In a series of studies, we found that the value of consumers’ time is not constant but depends on contextual characteristics of the decision situation. Our results also suggest that in deterministic situations, people make decisions involving time losses in a manner consistent with the convex loss function proposed by prospect theory. However, in decision making under conditions of risk, people seem to make risk-averse choices with respect to decisions in the domain of time in contrast to the risk-seeking behavior often found with respect to decisions involving losses of money. We discuss the nonfungibility of time as an explanation for the discrepancy between decisions involving time and those involving money.

The old adage “Time is money” is meant to remind us that time is a scarce resource. Most of us hardly need the reminder. As society becomes more affluent, we are able to buy more material objects, but even the wealthy are limited to 24 hours per day. For many, time is not just a scarce resource; it is the scarce resource.

Although research on time has grown significantly (see Gross [1987] and Jacoby, Szybillo, and Berning [1976] for overviews of the literature), relatively little is known about how people make time-related decisions. Do consumers, in fact, treat time like money? That is, can we directly apply what we have learned from the numerous studies of financial decision making, or is decision making in the domain of time qualitatively different in some important ways?

The view that time as a resource is comparable to money is common in many approaches to the study of time. For instance, in his well-known economic theory of time, Becker (1965) equates the value of time to its opportunity cost, which is typically assumed to be the wage rate. Similarly, in discussing the perception of time in consumer research, Graham (1981) stated that people in Western culture have a “linear-separable” view of time: “Time is visualized as a straight line extending from the past into the future and separable into discrete units” (Graham 1981, p. 336). This view that discrete properties are associated with time fosters its comparison with other discrete items such as money and implies that choices are made in terms of allocating units of time among competing activities. In other words, time is perceived as having value and as capable of being bought and spent as well as saved and wasted.

One of the key findings in the psychology of monetary decisions is that losses are perceived differently than gains. In prospect theory, a descriptive model of choice originally formulated for decisions involving risk, Kahneman and Tversky (1979) define utility as a function of gains and losses and state that risk behavior differs when individuals face options involving gains and options involving losses. Subsequently, the distinction between gains and losses has also proved important in some domains of deterministic choice, addressed in Thaler’s (1980, 1985) mental accounting model. If time is like money, then consumers should perceive time as being an intangible resource that can be augmented or reduced (i.e., saved [gained] or wasted [lost] relative to a reference point). Moreover, situations that consumers perceive as a waste of time—such as waiting situations—should be encoded as losses, and the loss function should be convex.

Using prospect theory and mental accounting as theoretical frameworks, we focus on waiting time that according to Larson (1987) is perceived by consumers

*France Leclerc is assistant professor of marketing at the Sloan School of Management, MIT, Cambridge, MA 01242. Bernd H. Schmitt is associate professor of business, Graduate School of Business, Columbia University, New York, NY 10027. Laurette Dubé is assistant professor of marketing, School of Medicine, Université de Montréal, Montréal, Québec H3C 3J7, Canada. The authors thank Daniel Kahneman, Dragaen Prelec, Itamar Simonson, and Richard H. Thaler for their insightful comments on a draft of this article.

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as a waste of time (i.e., a loss of time that could be used more productively). We examine empirically whether waiting-time decisions are in fact similar to monetary decisions. We focus on three key phenomena that have been demonstrated in previous research on monetary decisions: (1) context effects, (2) integration of losses, and (3) risk-seeking behavior for losses. Thus, we specifically address the following questions: (1) Do consumers attach a constant value to losses of time, or does the value of time depend on the decision situation? (2) How do consumers respond to multiple losses? Do they prefer to integrate or segregate these losses of time? (3) How do consumers make decisions about losses of time that involve risk? Are they risk averse or risk seeking?

To derive predictions concerning each of these three issues, we review findings based on prospect theory and mental accounting with respect to these three questions. When appropriate, we contrast the predictions of these behavioral decision theories with classic economic models such as Becker’s (1965) theory of time and expected utility theory. Subsequently, we report eight studies that test our hypotheses. Because it would be extremely difficult to control all the relevant extraneous factors in actual waiting situations, we have chosen to adopt the method of behavioral decision research: realistic hypothetical scenarios of situations that subjects have experienced in their own lives (see, e.g., Kahneman and Tversky 1984; Thaler 1985).

CONCEPTUAL OVERVIEW

Context Effects and the Value of Time

Is the value of time constant, or does it depend on the contextual characteristics of the decision situation? As mentioned previously, Becker’s (1965) well-known theory of time equates the value of time to its opportunity cost. According to this model, the value of time (at least of short periods such as a few hours) is a constant (i.e., the cost of waiting is a linear function of time). This assumes that the value of time is not influenced by any characteristic of the outcomes as long as the best alternative use of time is unaffected.1

Prospect theory, on the other hand, predicts that the value of time is subject to context effects. For example, if the diminishing sensitivity of prospect theory’s loss function holds for time, then the positive value of saving a given amount of time (e.g., 15 minutes) should be greater in the context of a short wait (e.g., one hour) than a longer one (e.g., five hours). Studies 1 and 2 explore the issue of whether the value of time is subject to the type of context effects postulated by prospect theory.

Integration and Segregation of Time Losses

How do individuals respond to multiple time losses, for example, two expected waiting periods of certain duration? It has been argued that people respond to outcomes involving multiple events depending on whether they mentally code the events in a separate or a combined mental account (Kahneman and Tversky 1984; Thaler 1985).

Specifically, because prospect theory’s value function is nonlinear, the overall subjective value derived from a pair of events should differ depending on whether the events are framed as separate or combined before they are evaluated. For gains, Thaler’s (1985) mental accounting model predicts that individuals derive more utility from two gains that are separated rather than combined. For example, individuals will be happier when they receive two “segregated” monetary gains of $50 and $25 than when they receive a lump sum of $75. In contrast, because of prospect theory’s convex loss function, the mental accounting model predicts that individuals will respond less negatively to combinations than segregations; individuals will be less unhappy, for example, if they have to pay the “combined” sum of $150 rather than $100 and then $50. Therefore, if waiting time is perceived as a loss, people should prefer an option in which time losses are integrated to an option in which they are segregated (Thaler 1985).

Recent tests (Thaler and Johnson 1990) of this “hedonic editing rule,” however, have shown that people favor integration of losses over their segregation only when the prospects are already combined for them. When subjects are given a choice with regard to the timing of events, such as having a bad event occur on the same day (which would facilitate integration) or on different days (which would facilitate segregation), subjects prefer to experience the losses separately. Moreover, Linville and Fischer (1991) proposed a “renewable resource model” that makes a similar prediction. The model postulates that people possess limited loss-buffering resources that are consumed in the process of coping with negative events. These resources, however, are renewable over time. People should therefore prefer to segregate losses (i.e., experience them on different days). The renewable resource model was tested for three decision domains, including financial decisions. For losses in the financial domain, it was found that subjects preferred to separate two negative events. However, this pattern of findings was obtained consistently only for large losses. For small losses, subjects split fairly equally in their preference for combining or separating (45 percent of the subjects preferred integration).

To summarize, if waiting-time decisions are analogous to financial decisions, then people should prefer

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1The context effects that we investigate are the amount of time waited and the amount of money spent. Of course the nature of the waiting situation (e.g., a hot, foul-smelling bus station vs. a beautiful park on a spring day) also matters (even in Becker’s theory), but all our scenarios hold this constant. Our narrow use of the term “context effect” is consistent with its use in other research in the choice literature (Huber, Payne, and Puto 1982).
to have losses of time integrated when the losses are already combined for them, in a "time lump-sum cost." However, when given the option of experiencing the losses temporally together (integrated) or temporally distinct (segregated), subjects' preferences should be split fairly equally, or they should prefer to have losses of time segregated. These predictions are tested in studies 3 and 4.

Risk Behavior Involving Waiting Time

Finally, how do consumers make time-related decisions involving risk? For situations involving risk and uncertainty, the standard economic model is expected utility theory, which has been used as both a normative and a descriptive model. In expected utility theory, the carriers of utility are assumed to be wealth or other final outcomes. Prospect theory, on the other hand, considers outcomes of decisions as changes relative to a reference point and distinguishes between losses and gains.

The shape of prospect theory's value function—the function is concave in the domain of gains and convex in the domain of losses, and it is steeper for losses than for gains—has interesting implications for risky decision making. Specifically, the concavity of the value function for gains should produce risk-averse choices for gains, and the convexity of losses should produce risk-seeking choices for losses. The conjunction of risk aversion for gains and risk seeking for losses should result in the reflection effect (Kahneman and Tversky 1979); that is, two otherwise identical problems—one described in terms of gains and the other described in terms of losses—should generate a pronounced shift from risk aversion to risk seeking because of opposite attitudes toward risks involving gains and losses.

For monetary outcomes, the prediction of risk-seeking behavior in the domain of losses has been supported by some investigators (Hershey and Schoemaker 1980; Payne, Laughhunn, and Crum 1980), but there is also some evidence that in the loss domain, subjects have no clear risk preferences (see Schneider [1992] for a review). For instance, Schneider (1992), using a scenario involving monetary outcomes (financial holdings) and a certainty option, found that approximately 50 percent of the subjects selected the certain option when the prospects were framed as a loss. Schneider (1992) argues that risk-seeking behavior is not consistently obtained in the domain of losses. She explains the lack of consistency for losses by the fact that people are conflicted about which of the two options is preferable.

Although the evidence in support of risk-seeking behavior in the domain of losses for simple prospects (a one-stage gamble) is mixed, decision makers have been shown to be risk seeking if they perceive an opportunity to escape the loss. Thaler and Johnson (1990) showed for two-stage losses that an initial loss can cause an increase in risk aversion unless the second choice offers the opportunity to break even (i.e., escape the loss). Risk seeking for break-even situations has been reported not only for monetary decisions but also in other domains such as sales quotas (Ross 1991).

Studies 5 and 6 explore the issue of whether subjects are risk seeking when they face decisions involving losses of time with simple prospects (a one-stage gamble) and with combined prospects (a two-stage gamble) involving a break-even opportunity. In study 7, the reflection effect—a switch from risk-averse to risk-seeking behavior as consumers' mental frames change—are tested in the domain of time. Finally, in study 8, we contrast, in the form of two gambles, a decision involving time risks and a decision involving monetary risks. Moreover, subjects are asked to provide reasons for their choices in order to explore potential differences in decision making for the two domains.

STUDIES 1 AND 2: CONTEXT EFFECTS AND THE VALUE OF TIME

Study 1

Graduate students (n = 136, 75 male and 61 female) from a large northeastern university participated in study 1. The scenario was modeled after Kahneman and Tversky's (1984) "calculator and jacket" problem. Kahneman and Tversky observed for monetary outcomes in exchange of time that 68 percent of the respondents were willing to make an extra trip of 20 minutes to save $5 on a $15 calculator, but only 29 percent were willing to exert the same effort when the price of the calculator was $125.

Subjects of study 1 read that they could save 15 minutes by paying an additional $2. In a between-subjects design, subjects were randomly assigned to one of two versions of the same scenario. In one version, subjects could save 15 minutes off a total travel time of one hour, whereas the second group could save 15 minutes off a total travel time of five hours. The monetary costs for saving time were held constant. The scenario read:

You are in the process of buying tickets for two different train rides, one ticket to City A and one ticket to City B. The local train ride to City A takes five hours, and the local train ride to City B takes one hour. Because of different demand for these destinations, prices for both trips are identical. When you purchase the ticket, you are informed that there is an express service to City B (A) that will take only 45 minutes (four hours and 45 minutes) instead of one hour (five hours) provided you pay an additional $2 to take the express. Will you pay the extra $2 to take the express?

The pattern of results was very similar to the results obtained by Kahneman and Tversky (1984). Fifty-eight percent of the subjects in the one-hour condition were willing to pay the additional $2 to save 15 minutes compared to only 33 percent in the five-hour condition. The difference was statistically significant (z = 2.81, p
<.05). In other words, as predicted by prospect theory, subjects were more likely to pay $2 to save 15 minutes when they experienced the loss during a short period (a trip of one hour) than during a longer period (a trip of five hours).

Study 2

Study 1 demonstrates that subjects’ willingness to trade a certain amount of money for saving time depends on time-related characteristics of the decision situation. As another demonstration of context effects, study 2 tests whether the value of time can be influenced by price-related characteristics of a decision situation. That is, are subjects willing to pay more money to avoid waiting the same amount of time for a higher-priced good or service than for a lower-priced product? Subjects were told:

On the day of the performance, you decide to purchase a pair of tickets for a show at the performing arts center. You are sure that the show will not be sold out. However, because you know that you and your friend will arrive right before the performance begins, you have chosen to purchase the tickets earlier in the day. Tickets will cost $15 ($40) each if you buy them at the student window of the box office. You have just arrived at the ticket counter when you realize that the student window will not open for 45 minutes. The window for regular tickets is already open, and you could purchase the same tickets there but at a higher price. In other words, you have to decide whether you should buy the tickets at the regular price now or whether you should wait for 45 minutes to buy the student tickets. How much would you be willing to pay to avoid waiting for 45 minutes?

The participants of study 2 were M.B.A. students (n = 67, 37 male and 30 female). Subjects completed their questionnaires in a classroom setting, and questionnaires with the two experimental conditions were randomly distributed. Results indicated that people were willing to pay twice as much to avoid waiting for the $40 ticket than for the $15 ticket ($7.20 vs. $3.60, t = 1.92 (39), p = .06).

Discussion of Studies 1 and 2

Results of studies 1 and 2 show that the value of time is subject to the type of context effects postulated by prospect theory. Thus, these results are inconsistent with the economic theory of time that predicts that the value of time is context independent (as long as opportunity costs are held constant). In both studies, in their assessment of the value of time, people were influenced by the value of the outcome of the waiting situations, either in terms of time-related characteristics of the decision situation (study 1) or in terms of price-related characteristics of the decision situation (study 2).

STUDIES 3 AND 4: INTEGRATION AND SEGREGATION OF TIME LOSSES

Study 3

In study 3, graduate students (n = 69, 38 male and 31 female) were presented with the following scenario:

Two people, Mr. X and Mr. Y, are going to a bank to cash a check during their lunch hour. Mr. X waits 30 minutes in line and then gets served very quickly. Mr. Y waits 20 minutes in line and then has to switch to another line because the computer terminal serving the first line has just broken down. He waits 10 more minutes in this new line. Who will be more upset, Mr. X or Mr. Y?

Seventy-five percent of the subjects (z = 4.15, p < .05 from an even split) concluded that Mr. Y would be more upset, which suggests, as predicted by the mental accounting framework, that people prefer to have losses integrated when the losses are presented to them as a time lump-sum cost.

Study 4

In study 4, graduate students (n = 49, 22 male and 27 female) read the following scenario:

Imagine that this weekend you have to run two errands that you know will involve some waiting time. You have to get concert tickets, and you know that you will have to wait in line 30 minutes to get these tickets. You also have to go to get your bike adjusted, and you know that this will require you to wait 15 minutes. Both places are open Saturday and Sunday, and you could either do both errands the same day and wait 30 minutes for the concert ticket and 15 minutes for your bike that day or do these errands on different day and wait 30 minutes one day and 15 minutes the other day. What would you rather do? Please try to focus on the waiting and assume that going to these places on the same day or on different days would cause the same inconveniences.

Would you rather
A—Wait 30 minutes for the concert tickets and 15 minutes for your bike the same day, or
B—Wait 30 minutes for the concert tickets on one day and 15 minutes for your bike the other day?

Results indicated that 80 percent chose the first option (z = 4.20, p < .001 from an even split). That is, a larger proportion of respondents preferred to have both waiting periods during the same day rather than on two separate days.²

Discussion of Studies 3 and 4

Study 3 shows that, as they do for money, people prefer integration over segregation in the domain of

²We also asked a different group of subjects (n = 45) a similar question, with the two waiting periods of the first option already combined, using the following question: "Would you rather wait 45 minutes today or 30 minutes today and 15 minutes tomorrow?" The proportion of subjects who preferred the integrated outcome was essentially the same as when the two losses were presented separately.
time when the prospects are already combined for them. Moreover, study 4 shows that subjects prefer integration of losses over segregation even when given a choice about the timing of an event. This finding is one of the few instances in which integration of losses was preferred when people were required to reframe an option actively. As mentioned previously, for monetary outcomes Thaler and Johnson (1990) found that subjects preferred to experience losses separately when they had the option of experiencing the losses in some temporal distance. Similarly, investigating this issue in three behavioral domains, Linville and Fischer (1991) observed that subjects displayed a weak tendency to prefer to experience small losses on separate days. In the present case, we demonstrated a strong tendency toward integration as opposed to the weak evidence for segregation obtained by Linville and Fischer (1991) for small losses and the evidence for segregation obtained by Thaler and Johnson (1990). Our results are therefore somewhat distinct from those observed in previous research in domains other than time. Reasons for this effect will be discussed in the section entitled General Discussion.

STUDIES 5, 6, 7, AND 8: RISK BEHAVIOR INVOLVING WAITING TIME

Study 5

How do people respond to risky choices involving time-related outcomes? If waiting is considered a loss, and if prospect theory's convex loss function applies, then one should expect to observe risk seeking with waiting time, as with monetary losses. Risk behavior for simple prospects was investigated in study 5 with undergraduate students \((n = 213, 110\) male and 103 female) in the following scenario:

Imagine that you are going to New York City by bus. You are planning to take a chartered bus that offers a special \$40 student fare. While you are walking to the bus station, you run into a friend of yours who tells you that the chartered bus you were planning to take will not leave for 60 minutes. However, he tells you that there are other buses leaving from campus at the same fare. You are equally far from both locations. Your friend tells you that there is a bus leaving from campus every hour and that the next one will leave in 30 minutes. You estimate that you have a 50% chance of catching the bus that is leaving in 30 minutes and a 50% chance of catching the one that is leaving in 90 minutes. If you decide to go to campus and find out that the bus leaves in 90 minutes only, you will not have the time to go back to the bus station to catch the one that leaves in 60 minutes. What will you do?

A—Go to the bus station and definitely wait 60 minutes, or

B—Go to campus and take a 50% chance of waiting 30 minutes and a 50% chance of waiting 90 minutes.\(^3\)

Seventy percent of the subjects chose the first option \((z = 5.84, p < .01\) from an even split).\(^4\) That is, in contrast to the risk-seeking behavior predicted by prospect theory, subjects were risk averse for the waiting-time decision.

Study 6

In study 6, we investigated risk behavior in a situation involving two-stage losses. In one version of the scenario, subjects had the possibility of breaking even, while escaping from the loss was not possible in the second version. In addition, we tried to provide a context that made clear how the probability estimates are derived so that subjects felt that these numbers could be trusted. Subjects \((n = 98, 50\) female and 48 male) were presented with one of two versions of the following scenario:

You are on your way to San Francisco. You are booked on a flight with a two-hour stopover in Chicago. Your flight was scheduled to leave three hours ago, but there seems to be a problem with the aircraft. You have just been told that your flight was canceled and that all passengers need to be rescheduled onto another carrier. The other airline offers nonstop flights to San Francisco, and total travel time to San Francisco will be approximately three hours shorter. The airline agent processes each passenger one by one. You are the last person to be processed. The agent explains to you that you have two options. First, there is one seat left on a flight that has been cleared to leave in three hours. If you select this option, you are guaranteed to leave in three hours (and arrive three hours later in San Francisco than your original flight). Alternatively, the airline also has 25 seats available on a flight that is currently boarding, but so far 49 people have requested these seats. The agent shows you the list of people and asks you if you would like to add your name to the list. The agent explains that passengers will be randomly picked from the list; so if you add your name, you have a 50% chance of being selected for the flight (and arriving in San Francisco at the same time as your original flight). However, if you are not selected, the agent explains that you must take the last flight for the day, which leaves in six hours (and arrives six hours later in San Francisco than your original flight). You are told that you must make up your mind now and choose one of the two op-

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\(^{3}\)Our main interest in this scenario concerned certainty versus risk, because Schneider and Lopes (1986) tested the reflection effect and found that it was obtained reliably only if the choice pair included a lottery with a certain outcome. Thus, we decided not to introduce many variations in the probabilities associated with the risky outcomes. We usually operationalized risk as a 50-50 chance between two possible outcomes.

\(^{4}\)Two other groups of subjects were asked a similar question in which subjects had a flight to catch and faced a choice between a certain option and a risky one. The results were strikingly consistent with those obtained for the bus situation. In these two other groups of subjects, at least 66 percent of the subjects were risk averse.
ations. You are also told that you cannot reapply for the flight leaving in three hours in case you choose to take the gamble and fail. What will you do?

A—Take the guaranteed seat and leave for sure in three hours (and arrive three hours later in San Francisco than your original flight), or

B—Add you name to the list with a 50% chance of leaving now (and arriving in San Francisco at the same time as your original flight) and a 50% chance of leaving in six hours (and arriving six hours later in San Francisco than your original flight).

The second version was essentially the same, except that there was no chance to break even. Subjects read that taking the guaranteed seat would get them four hours later to the final destination unless they elected the gamble with a 50-percent chance of arriving one hour later than the original flight and a 50-percent chance of arriving seven hours later than the original flight.

In the no-break-even version, 86 percent of the subjects selected the certain option ($z = 5.14, p < .001$ from an even split). Consistent with Thaler and Johnson’s (1990) findings for two-stage monetary losses with no opportunity to break even, our study found that subjects were risk averse when two-stage losses involving time were experienced. Surprisingly, in the break-even version, 72 percent of the subjects also selected the certain option ($z = 3.15, p < .05$ from an even split). That is, even when subjects were provided with the opportunity of breaking even and escaping the loss, they still remained risk averse. In fact, the level of risk-averse behavior does not differ significantly ($\chi^2 = 2.41, p = .12$) when there is an opportunity to break even and when there is no such opportunity.

Study 7

Another aspect of the loss function of prospect theory is the so-called reflection effect. According to the reflection effect, individuals should be risk averse when losses are framed in terms of gains but risk seeking when prospects are framed in terms of losses. In other words, keeping outcome probabilities constant, a change in the reference point should lead to a change in risk behavior. To investigate the reflection effect, subjects, in a between-subjects design, were presented with either a gains scenario or a losses scenario. Subjects ($n = 88, 48$ male and $40$ female) were randomly assigned to one of two versions of the following scenario. Version 1 subjects ($n = 47$) read the following scenario:

You usually drive to school. Today, however, you have to take the bus, and the ride might take you 45 minutes. Fortunately, there are two people around who could give you a ride home, Mr. R. and Mr. T. With Mr. R. the ride will take you 25 minutes, so you will save 20 minutes for sure. Mr. T. may have to pick up his wife on the way back but does not know yet. If you take a ride with Mr. T., there is a 50% chance that you will save 30 minutes (if he does not pick up his wife) and a 50% chance that you will save 10 minutes (if he picks up his wife). You have to decide now because others are seeking rides from Mr. R. and Mr. T. Will you take a ride with

A—Mr. R. and save 20 minutes for sure, or

B—Mr. T. and have a 50% chance of saving 30 minutes and a 50% chance of saving 10 minutes?

In this gains versus the scenario, as expected, subjects behaved in a risk-averse manner: only 23 percent chose the latter option ($z = 3.70, p < .01$ from an even split).

In version 2, the losses version, subjects ($n = 41$) were told:

You usually drive to school, and it takes you five minutes. Today, however, your car has to be fixed, and you cannot use it. You found out that there are two people around who could give you a ride home, Mr. R. and Mr. T. With Mr. T. the ride will take 25 minutes for sure, so you will lose an extra 20 minutes. Mr. T. may have to pick up his wife, so there is a 50% chance that you will lose 10 minutes (if he does not pick up his wife) and a 50% chance that you will lose 30 minutes (if he picks up his wife). You have to decide now because others are seeking rides from Mr. R. and Mr. T.

Will you take a ride with

A—Mr. R. and lose 20 minutes for sure, or

B—Mr. T. and have a 50% chance of losing 10 minutes and a 50% chance losing 30 minutes?

In the losses version, in contrast to the predictions of prospect theory, a majority of the subjects were risk averse. Only 41 percent of the subjects chose the latter option ($z = 1.15, p > .10$ from an even split).

Although the framing manipulation had a marginally significant effect on risk behavior ($\chi^2 = 3.29, p < .10$), there was still no indication of risk-seeking behavior in the loss frame. In sum, with respect to decisions involving waiting time, people behaved in a risk-averse or, at best, a risk-neutral way. They seemed to be marginally less risk averse, though, when a prospect was framed in terms of losses than in terms of gains.

Study 8

The preceding three studies, when contrasted with previous research, suggested that consumers seem to approach monetary decisions and decisions involving time differently. However, in none of the studies were subjects asked to make decisions about both time and money. Furthermore, the exact nature and the potential reasons for the observed differences between monetary decisions and decisions involving time remained unclear. Therefore, study 8 was designed to accomplish two objectives: first, to test more directly whether consumers are more risk averse for decisions involving time than for monetary decisions, and second, to explore potential reasons for this difference.

\footnote{A series of framing problems involving losses of time was collected. To be conservative, the one presented is the one in which the strongest risk-seeking effect was obtained.}
In this study, subjects were asked to make a decision involving loss of time, then to make a decision involving loss of money, and, finally, to provide reasons for their answers to the two decisions. Clearly, the decision context as well as the stakes involved may differ in decisions about time and decisions about money. Therefore, to control for variations in the perceived decision context and the inferences that subjects draw from it, subjects were presented with two gambles instead of decision scenarios, one gamble involving time and the other involving money. Also, before the study was conducted, we asked another group of subjects to give an estimate of the monetary value of their time in order to provide roughly equivalent stakes for both domains. To elicit these monetary values of time, subjects were asked to imagine that while waiting for a bus, they could save waiting time if they were willing to pay some extra money. They were then asked how much money they were willing to pay with respect to three waiting periods (30, 60, and 90 minutes). The mean value of time reported was approximately $5 for a wait of 30 minutes.

The participants of study 8 were graduate students ($n = 36, 21$ male and 15 female). The two scenarios were presented on separate pages. Subjects were instructed not to turn back after they had turned each page. They were first presented with the two gambles and then asked to explain in writing why they had responded to each gamble the way they did. In the time gamble, subjects were asked to choose between a 60-minute wait and a 50-percent chance of either a 30-minute or a 90-minute wait. In the money gamble, the subjects were asked to choose between a loss of $10 and a 50-percent chance of losing either $5 or $15. The exact wording of the two gambles was as follows:

Question 1
Please choose between the following options.
A—Having to wait 60 minutes for sure.
B—A 50% chance of waiting 30 minutes and a 50% chance of waiting 90 minutes.

Question 2
Please choose between the following options.
A—A certain loss of $10.
B—A 50% chance of losing $5 and a 50% chance of losing $15.

As expected, in the time gamble significantly fewer subjects chose the risky option: 47 percent in the time gamble compared to 70 percent in the money gamble (paired $t$-test, $t = 2.5$ (35), $p < .05$). Moreover, the result of the time gamble (i.e., the number of subjects choosing the risky option for time) is not significantly different from an even split ($z = .36, p > .10$), and the result for the money gamble is significant ($z = 2.4, p < .05$).

Once again, in the time domain there is no indication of risk-seeking behavior. Moreover, the proportion of subjects choosing the risky option in the time gamble was significantly lower than the proportion of subjects selecting the risky option in the domain of money. To explore potential reasons for this difference, subjects’ responses to the open-ended question were coded and analyzed.

Most (14) of the 17 subjects choosing the risky option in the domain of time provided a reason that can be interpreted as reflecting the shape of their value function. They stated that the risky option was providing them with a chance to do better, while the worst outcome was not so terrible, which suggests that a wait of 60 minutes is much worse than a wait of 30 minutes, while waiting for 90 minutes is not much worse than waiting for 60 minutes. This convex function is consistent with their risk-seeking behavior. Of the 19 subjects selecting the risk-averse option in the time gamble, three also justified their decision by a statement reflecting a value function consistent with their risk behavior. They mentioned that they did not want to take the risk of a potential wait of 90 minutes, which would be much worse than the 60-minute wait. More interesting, 14 of those 19 justified their decision by stating that certainty would allow them to plan their time better.6 The ability to plan with respect to time seems to be a major factor in avoiding risk in this domain, much more so than in the money domain, in which only three of the 11 subjects selecting the risky option mentioned financial planning. The remaining subjects in the money gamble provided reasons similar to the ones given in the time domain, which reflects the shape of the value function.7

The exploratory analysis thus revealed one important reason why subjects may respond differently to time decisions than money decisions. Subjects stated that the certainty of a definite waiting time allows them to plan better. Most other subjects proposed reasons that reflect the shape of their value function and are consistent with their risk behavior.

Discussion of Studies 5, 6, 7, and 8
Studies 5, 6, 7, and 8 demonstrate subjects’ tendency to avoid risk for time decisions and to be significantly more risk averse for time decisions than for monetary decisions. Our results are especially surprising for situations offering a break-even opportunity (study 6). Even though the opportunity to break even generated, as in previous research, less risk aversion than in the no-break-even scenario, the difference was not signific-

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6. In another study not reported here, we replicated the risk aversion for time decisions by offering a break-even opportunity, using the airline scenario of study 7. As in study 8, we asked subjects to provide reasons for their choices. Again, the concern about planning emerged as the most important reason, thus replicating the thought protocol results of study 8 in the context of a real-life waiting scenario and a scenario with a break-even opportunity.

7. Also, people were more likely to be consistent in their choices for the two gambles than not; of the 36 subjects, 24 chose the same option for both problems (15 were risk seeking for both, and nine were risk averse for both). When inconsistent in their decisions for the two gambles, subjects were more likely to be risk averse for time and risk seeking for money (nine subjects) than the other way around (two subjects).
cant and was small compared to similar decisions in financial and other domains. Similarly, the reflection effect problem (study 7) also generated results that were directionally consistent with findings for the financial domain. However, again, the proportion of people selecting the risky option was lower than in other reflection effect studies in which drastic changes had been observed. Most important, while studies 5, 6, and 7 only suggest a difference in decision making between time and money, study 8 directly shows that individuals are more risk averse with respect to time than money.

In prior research, potential moderators of risk-seeking behavior have been suggested, yet they fail to explain our results. Specifically, Van der Plight and van Schie (1990) and van Schie (1991) proposed that risk-seeking behavior for losses increases with the importance of the domain and decreases with the familiarity of the domain. However, in study 8 we observed a difference between choices for time and money, even though the level of familiarity was controlled via a gamble-like scenario and the two situations were constructed to be equally important (at least in terms of the level of the stakes). Furthermore, our results suggest that in the domain of time, raising the stakes increases risk aversion, the opposite of what would be predicted by Van der Plight and van Schie (1990). We found that for a wait of 30 minutes in study 7 (losses version), 59 percent of the subjects selected the certain option, while for a wait of seven hours (study 6, no-break-even version), 82 percent of the subjects selected the certain option. Although these two results are not strictly comparable, they suggest nonetheless that the relationship between the importance of the stakes or the domain and risk behavior does not provide an adequate explanation for our results.

If the moderators suggested in previous research cannot serve as explanatory factors for all our results, how can we explain the differences in risk seeking between time and money? Study 8 may serve as a starting point for an answer to this complex question. In study 8, a large majority of risk-averse subjects justified their choice by arguing that it would allow them to make better plans. We will elaborate on why we believe this is an important issue in the next section.

GENERAL DISCUSSION

Is time like money? Yes and no. In some decision situations, our respondents' choices regarding time were similar to those typically found for monetary choices, while for others they were different. We will first summarize our findings with respect to the three key issues: (1) context effects, (2) the integration of losses, and (3) risk-seeking behavior for losses. Then we will propose an explanation for our pattern of results.

First, do consumers attach a constant value to waiting time, or does the value of time depend on the decision situation? In two studies, we have shown that, as with money, the value of time seems to be highly context dependent. In study 1, the marginal value of time was higher in the context of a short wait than a long one. In study 2, we found that the value of time was higher when waiting was associated with a good or service of high monetary value rather than low value.

Second, how do consumers respond to multiple losses of time? Do they prefer to integrate or segregate these losses of time? As they do for money, subjects preferred to integrate losses when the prospects were already combined for them. However, contrary to what they do for money but consistent with the loss function of prospect theory, subjects also wanted to integrate waiting time when they were given a choice about the timing of events.

Third, how do consumers make decisions about losses of time involving risk? Are they risk averse or are they risk seeking? For decision making involving risk, our results provide no empirical support for the supposition that waiting, a loss of time, is like losing money. To the contrary, people were consistently risk averse or, at most, risk neutral.

How can we make sense of this combination of results? What can explain the differences between decision-making behavior with regard to time and money in some situations but not others? We first examine whether we can explain these results by relaxing one or both of the two assumptions initially made about how people experience waiting time—that waiting is encoded as a loss of time and that the loss function is convex, as predicted by prospect theory. We will then propose an alternative theoretical account that we feel provides a better explanation for our findings.

Waiting as a Loss Function

One possible explanation for our findings may be that waiting is not coded as a loss but merely as a cost, just as in the mental accounting literature wherein spending money for routine transactions is not coded as a loss unless the price exceeds the normal or reference price (Thaler 1985). In this framework, waiting would only be coded as a loss if the wait exceeded some expected waiting time. This analysis can be used to explain the risk-averse choices by the subjects in studies 5 and 8 if the subjects simply coded the amount of waiting time in the certain option as the reference point and viewed the risky option as creating the potential of a loss. In that case, the fact that the certain option was selected by most subjects could simply reflect loss aversion in the domain of time. However, although this framework may seem appealing, it cannot explain the risk-averse choices observed in the other two studies in which losses were made explicit (in study 6 by first imposing an initial loss and in study 7 by explicitly framing the waiting time as a loss). In these studies the waiting time should be coded as a loss even if "normal" waiting is not, and yet risk aversion prevails.
The second assumption that may have been at fault in our initial framework is the assumption that the shape of the loss function is convex. Perhaps waiting is coded as a loss, but losses of time are not perceived to be diminishing in value. If waiting becomes more and more aversive, then risk aversion would be expected. However, once again this modification can only explain some of our results. In the deterministic decisions, our results imply that the aversiveness of waiting displays diminishing, not escalating, sensitivity. In study 1 the marginal value of time was a decreasing function of the time lost, and in studies 3 and 4 subjects preferred to integrate losses of time, as they should if losses of time are convex. Also, the justifications offered by subjects for their choices in the time version of study 8 do not suggest that the shape of the value function can explain the risk-averse behavior. For those who chose the risk-seeking alternative, a large majority (14 out of 17) did give a justification consistent with a convex function, but very few of the subjects choosing the risk-averse option (three out of 19) offered an explanation that can be construed as suggesting a concave cost of waiting function. As discussed previously, most of these subjects mentioned planning as an explanation for their decision. We feel that if the concavity of the value function were responsible for the lack of risk-seeking behavior, it would have emerged more clearly in the pattern of responses. Of course, this discussion would easily be settled if there were a reliable method for directly eliciting the value function for waiting. However, in the absence of a "utility meter," the value function can only be elicited indirectly (for one recent approach, see Carmon and Kahneman [1992]).

A discrepancy between the shape of an elicited value function and the outcome of probabilistic decisions has been reported elsewhere and is not limited to the domain of time. (See Keller [1989] for an extensive discussion of this issue.) Recent research (e.g., Kahneman and Snell 1990; Varey and Kahneman 1992) reports similar results in other domains. For instance, Varey and Kahneman (1992) reported that when subjects were asked whether some stimulus (such as maintaining a restricted posture) would become better or worse over several days, most subjects thought it would get worse (i.e., that the loss function for standing posture escalates). For such a loss function, one would expect subjects to make risk-averse decisions. However, most subjects gave risk-seeking responses to choices involving the same stimuli. This line of research suggests that principles other than psychophysics may dominate in making risky decisions. We believe that these principles are likely to be a function of the domain in which the decision is made.

With respect to the domain of time, a closer look at our results reveals that in most deterministic situations, behavior for time and money domains was consistent, while in all the situations involving risk, the behaviors differ. Obviously, deterministic and probabilistic decision situations differ in terms of the presence of uncertainty or lack thereof. Thus, the difference in behavior between domains of time and money seems to be related to the presence of uncertainty. Indeed, in a normative theoretical analysis, Osuna (1985) suggested that uncertainty is a major cause of the psychological stress associated with waiting. Maister (1985) reached similar conclusions. Our results seem to confirm that individuals try to avoid uncertainty in time-related decision making whenever they can.

Time Is Less Transferable than Money

Why does the presence of uncertainty create special problems in the domain of time? We believe that uncertainty is more aversive in time than monetary decisions mainly because outcomes of time (losses or savings) cannot as easily be transferred (i.e., recouped or applied) to new situations as can outcomes of money. In other words, time is less fungible, or substitutable, than money. As a result, planning is especially important for time—even more so than for money—and because uncertainty makes planning difficult, uncertainty is especially aversive in this context. For example, if the taxi to the airport costs $50 more than expected, this loss can be dealt with by reducing consumption elsewhere, but if the ride to the airport takes an hour longer than expected, the hour may be difficult to recoup. Similarly, gains of time are less valuable than comparable gains of money unless there is some way to make good use of the time saved. As stressed by Gross (1987), time cannot be stored. At best, time savings may be applied immediately, but they cannot be saved. That is, if the taxi arrives 15 minutes earlier than expected at the airport, one may have a coffee before the flight, but one cannot store 15 minutes and use them to have a cup of coffee after arrival at the final destination. This combination of accentuated costs of losing time and attenuated value of gaining time makes certain outcomes, which allow planning, particularly attractive. Indeed, subjects in study 8 stated explicitly that certainty allows them to plan better. Similar arguments were not mentioned for monetary decision making.

This reasoning also explains the result of study 4—the only finding in the deterministic situations that was inconsistent with the findings in the domain of money—in which respondents selected the integrated option when the prospects were not framed for them initially and they were given the option of experiencing the losses temporarily together (integrated) or temporally distinct (segregated). This result, although consistent with the convex function of prospect theory, has not been found for money. The fact that time is not fungible suggests that the time at which the loss of time occurs is relevant. In other words, two half-days interrupted by some minutes of errands are not as valuable as one uninterrupted half-day and one half-day interrupted by a longer period. This observation seems to be well understood by
professors at research universities who want to concentrate their teaching as much as they can so as to have uninterrupted time to conduct research. Finally, the lack of fungibility of time is also apparent in the results of studies 1 and 2, in which context effects were demonstrated. In these studies, people do not seem to treat time as if it were fungible, that is, easily substitutable across domains and contexts. It is the implicit assumption of fungibility combined with the explicit assumption of optimization that makes Becker’s (1965) economic analysis of time possible, and these assumptions are what generate the implication that the value of time is equal to the wage rate. However, if the value of time waiting for an expensive ticket is not equal to the value of time waiting for an inexpensive ticket, then it is clear that consumers are not (even implicitly) optimizing the way they allocate their time.

In conclusion, aversion of uncertainty due to the nonfungibility of time seems to have a large impact on risk attitudes. In other words, time, like money, is a scarce resource; it is also a very precious one because, unlike money, time savings and time losses cannot easily be transferred and exchanged.

[Received February 1993. Revised November 1994. Kent B. Monroe and Brian Sterntahl served as editors and Deborah Roedder John served as associate editor for this article.]

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