Spending Time versus Spending Money

Erica Mina Okada

University of Washington

and

Stephen J. Hoch

University of Pennsylvania

May 2003

Erica Mina Okada is Assistant Professor of Marketing at the University of Washington Business School, Box 353200, Seattle WA 98195 (emokada@u.washington.edu) and Stephen J. Hoch is John J. Pomerantz Professor of Marketing at the Wharton School, University of Pennsylvania, Philadelphia, PA 19035 (hochs@wharton.upenn.edu).

Abstract

Ben Franklin warned all who would listen that time is money and economists ever since have concurred. Although we agree that an understanding of the opportunity costs of time is important to making good decisions, in this research we find systematic differences in the way that people ex ante spend time versus money and ex post differences in how they evaluate decision outcomes experienced after spending time or money. Specifically, people ex post are able to more easily accommodate negative outcomes by adjusting the value of their temporal inputs. Also, ex ante people are willing to spend more time for higher risk, higher return options whereas when spending money the pattern is reversed and the more standard pattern of risk aversion is observed. The inherent ambiguity of the value of time promotes accommodation and rationalization and may explain the rather obvious observation that most people are a lot more willing to waste time than money.

Spending Time versus Spending Money

Benjamin Franklin said, "Remember time is money" implying that time is valuable just like money. A moral interpretation might be that time should be spent wisely and not wasted. An economic interpretation might be that the value of one's time can be expressed in monetary terms as an opportunity cost, which often is represented one's wage rate (Becker 1965). Either way time and money are both mediums of exchange. People can acquire products either by paying hard cash (money) or expending effort (time), but typically there is a trade-off between the two currencies. Consumers incur temporal transactions costs in the process of information search and uncertainty reduction (Carlson and Gieseke 1983; Marmorstein, Grewal and Fishe 1992; Stigler 1961), or as an additional cost of consumption in the form of delays (Taylor 1994). Consumers generally pay a premium for convenience, and go the distance for a bargain.

But there are reasons to suggest that consumers do not treat time and money in the exact same fashion, even if they should do so normatively. Research has shown that people fail to calculate the opportunity costs of time when unstated (Neumann and Friedman 1980) and underestimate them when explicitly prompted (Hoskin 1980). An individual's hourly wage rate *w* is a commonly used benchmark for one's opportunity cost, and accordingly one should be indifferent between paying *w* in cash and spending an hour of time working in order to acquire a product. Systematic under-weighting of opportunity costs (Thaler 1980, 1999) leads individuals to work for one hour (analogous to selling time) for *w* or more even though they are only willing to pay less than *w* in cash to spare the expenditure of their own effort (analogous to buying time). Under-appreciation of opportunity costs leads to people being temporal spendthrifts and monetary misers, wasting time on lower value activities at the expense of higher value pursuits. At the same time, however, Larrick et al. (1990) have shown that people can effectively be trained to use normative cost-benefit rules of choice.

The Value of Time Is Ambiguous

A key difference between time and money as currencies is that the opportunity cost of money is easy to assess, whereas the opportunity cost for time is more ambiguous. Opportunity cost captures the concept of the next best use for the resource. The question is: what is the next best thing that one can do with the money or time if one chooses not to spend it on the item at hand? Money has a readily exchangeable market, is highly liquid and fungible, and can be saved. A dollar is a dollar no matter the transaction type and so what comes to mind as the next best use for money remains fairly constant across situations. In contrast, time is not as readily exchangeable and is perishable and cannot effectively be inventoried for use at a later time, despite some ability for postponement. Overall, time is a more ambiguous currency than money (Soman 2001), open to multiple interpretations (Hoch and Ha 1986) that depend on the situation. People may be more practiced and therefore reliable at spending money than time or at least more experienced at trading money for goods compared to bartering time for goods. If you actually think about it, however, people have plenty of opportunities each and every day to spend (or waste) their time, but the transactions may be more ad hoc and informal than those involving money. Overall, there is a relatively narrow range of second best things that one can with one's money, but the range of the second best uses for one's time is highly variable. That makes the opportunity cost, or the next best use, more ambiguous for time than for money.

Spending time and money also differ because consumers face a different set of budget constraints for each. When consumers spend money, they face two constraints: one that is chronic, their total wealth; and one that is acute, due to momentary liquidity issues which often can be overcome through the borrowing or saving process. The low current US savings rate and mounting credit card debt suggests monetary budget constraints often are quite real. Consumers also face temporal budget constraints as witnessed by the many media accounts of the time-harried consumer and complaints by

middle age parents, teenagers, and even some senior citizens that they never have enough time. We believe, however, that temporal budget constraints actually are pretty soft. There are 24 hours in a day. With 8 hours devoted to work and 8 for sleep that still leaves 1/3 of a day left over for discretionary activities. Since time use is discretionary so is its valuation.

How valuable is this time? Should it be valued at one's wage rate or are the opportunity costs associated with this time more valuable due to scarcity or less valuable due to abundance? Clearly there may be important cultural (US, EU, Asia) and life-stage (teen, middle age, senior) differences, but irrespective our view is that the value of time is flexible. People can more easily adjust the value of their time to the particulars of the situation. Because we face many decisions each and every day about whether and how to spend this discretionary time, we have more degrees of freedom about how we can spend this resource. People in some professions (e.g., doctors, lawyers, consultants, commissioned sales people) have had lots of practice at pricing their work hours and probably have a more precise notion of the opportunity costs of their discretionary time, though as Scitovsky (1976) cogently pointed out, sometimes these people act as if work is actually consumption. We would argue that everyone ends up spending a significant amount of available time that falls in between the extreme of eating and sleeping and required hours on the job for pay.

This built-in flexibility due to the ambiguous value of time leads to certain spending patterns that deviate systematically from those normally associated with monetary expenditures. Consumers are likely to be more adaptable in what they believe their time is worth and what constitutes an acceptable implicit wage rate. The lability of these implicit wage rates probably has two sources: one systematic due to the inherently different characteristics of time and money; and one unsystematic due to inconsistency in paying with time. The greater ambiguity of the value of time likely supports what Hsee (1995, 1996) has called elastic justification, allowing individuals to be more opportunistic

in their valuation of time expenditures. People may be more willing to write-off losses since it is undoubtedly the case that all of us have at least as much experience wasting time as we do wasting money. Our view is that people have a much easier time living with the former rather than the latter and can more easily write off losses in time than losses in money, a view supported by Soman's (2001) finding that sunk costs involving expenditures of time are more easily ignored than expenditures of money. And if consumers have an easier time self-justifying losses of time, then we might expect that they are more willing to take risks when making time investments compared to when make money investments.

In a series of five experiments w provide evidence that it is the inherent ambiguity in the value of time that supports/justifies a different spending pattern than that observed with money. The first two studies examine ex post expenditures of time versus money. Study 1 shows that the overall satisfaction with an acquisition is less sensitive to the consumption experience when people pay in time than in money as people have an easier time accepting bad outcomes when they pay with time. The experiment provides direct evidence that people flexibly adjust the value of their time expenditures to be congruent with the realized outcome. Basically you should get what you pay for, so if the outcome is positive (negative) people infer a higher (lower) value of the time that they expended in the acquisition. This kind of flexible valuation is harder to do with money, since its value is not as ambiguous. Note that these results cannot be explained by a cognitive dissonance story since the need for dissonance reduction should be greater after spending money (Soman 2001). Study 2 shows that when people pay using a fictional currency with a volatile exchange rate (suggesting ambiguity in value) their ex post evaluations of positive and negative outcomes are more like those made when paying with time. This provides further support that it is the ambiguity in the value of the currency that drives the observed pattern.

The remaining studies examine ex ante expenditures of time and money. Studies 3 and 4 utilize simple, equal expected value lotteries of both monetary and non-monetary outcomes. When people spend money, they display the standard pattern of increasing risk aversion to higher variance (higher risk, higher reward) gambles. When paying with time, the pattern completely reverses and subjects are willing to pay more time for higher variance gambles. The final study uses multi-attribute products, either average on all attributes or strong on some and weak on other attributes, and again demonstrates that people are willing to take more risks when paying with time rather than money, presumably because they can more easily adjust the value of their time expenditures to whatever is the realized outcome.

Experiment 1

We conducted the first study to determine how individuals value expenditures made in time versus money under varying conditions of consumption experience, and to understand why their valuations of the two currencies may differ. We took different measures of the opportunity cost of time and money. First, we assessed the opportunity cost of time and money based on inference. Building on the framework that the merit of an exchange transaction, that is how happy or unhappy individuals are with the exchange overall, is a positive function of consumption experience, and a negative function of the expenditure made in the acquisition, we measure the merit of transaction directly, operationalize the consumption experience, and infer the value of the expenditure as the opportunity cost from the two former measures. We also directly measured the opportunity cost using a dollar metric.

Experiment 1 tested the prediction that having paid in time attenuates the level of satisfaction with the overall exchange transaction because the opportunity cost of time is relatively flexible and furthermore reflects the consumption outcome, and having paid in money amplifies the level of satisfaction with the overall exchange transaction because the opportunity cost of money is relatively fixed. The basic idea is that when the

consumption experience turns out bad, people will have an easier time rationalizing an expenditure of time than money because the value of time is more labile and easier to write-off.

Method

Three hundred and sixty undergraduate students participated in the experiment. The subjects completed a questionnaire that presented two scenarios where they had already consumed a product that they had previously acquired through the expenditure of either time or money. Two product classes were used: a dinner for two at a downtown restaurant, and a pair of athletic shoes. These are both relevant and familiar products to the subject pool.

There were two levels of currency: time and money. A pre-test (n=26) determined that for $50, subjects were willing to perform 240 minutes, or four hours of data entry work, a wage rate of about $12.50/hour. In the time condition of the main experiment, subjects were told they had spent four hours doing data entry in order to acquire either a dinner for two, or a pair of athletic shoes. In the money condition, they were told that they had spent $50 for the acquisition. The experiment implemented a design according to Winer, Plan 5 (1971). The design was a Latin square crossing two levels of product with two levels of currency. The subjects were randomly assigned either to group 1 or group 2 according to a Latin square design to control for presentation order. Half of each of group 1 and group 2 saw the restaurant scenario first and they were order 1. The other half of each of group 1 and group 2 saw the athletic shoes scenario first and were order 2.

There were two between subject's variables: consumption outcome and purchase decision context. The between subjects consumption outcome, which was either positive or negative, was a between subject manipulation that was crossed with the Latin square. Subjects in the positive (negative) condition were given a scenario where the consumption experience at the restaurant or with the athletic shoes was described in a

very favorable (unfavorable) way. The positive and negative outcomes for the restaurant scenario appear below:

> **Positive Outcome**: When you arrived at the restaurant for dinner, you right away liked the ambiance. The table where you were seated was cozy and out of the way of foot traffic. The service was very prompt and courteous, and the food was delicious, the best you've had in a long time. Your friend and you had a great time. You would definitely go back there again, and recommend the restaurant to family and friends.
>
> **Negative Outcome**: When you arrived at the restaurant for dinner, you right away disliked the ambiance. The table where you were seated was tight and right next to the noisy service station. The service was very slow and rude, and the food was horrific, the worst you've had in a long time. Your friend and you had an awful time. You would definitely never go back there again, and would discourage any family or friend from ever going there.

The other between subjects variable had three levels, which differed according to the context in which the initial purchase decisions were made. One-third of the subjects were given a scenario where they were told that they had made the initial purchase decisions individually. Another 1/3 was told that they had made the initial purchase decisions as a part of a group: "You and some of your classmates decided as a group to…" And the other 1/3 was told that they had made the initial purchase decisions during a very busy week of final examinations. We introduced the group condition to distinguish between motivation and heuristic as drivers for differential valuations of money versus time. Previous research has demonstrated that the need for self-justification becomes irrelevant after group decisions (Whyte 1991). If the phenomenon that we are studying is due to motivation for justification, we expect the relative flexibility in the valuation of time to disappear or decrease in magnitude when the initial purchase was made as a part of a group. If the relative flexibility in the valuation of time is due to a heuristic that individuals use to cope with ambiguity, then the group context should have no effect. We introduced the constrained time condition to test the limits of the ambiguity of time. We wanted to test the robustness of any observed flexibility in the

valuation of time when the scarcity and value of time is made more salient and the opportunity cost (time spent on data entry vs. studying for finals) is more apparent.

Measures

Subjects provided a total of three responses to the set of two scenarios that they read. First, for each of the two scenarios, subjects were asked how satisfied they would be overall after consuming the product. This measured the merit of the transaction, and was on a scale of 1 to 7, with 1 being "I would be extremely dissatisfied", and 7 being "I would be extremely satisfied". High (low) merit indicates that subjects were happy (unhappy) with the overall exchange transaction.

In the time condition only, they were then asked what they thought the monetary equivalent of their time expenditure would be. This provided a direct measure of the opportunity cost of time in monetary terms. If the stated monetary equivalent of time expenditure is higher (lower) when the consumption outcome is positive (negative), it would support the idea that flexible temporal wages rates allow consumers to more effectively accommodate to received outcomes by adjusting the value of their time inputs.

Results and Discussion

Our attempt to manipulate the initial decision context (individual choice, group choice, busy time) had no impact on the results. The grouping variable and order also were not significant. The results after collapsing across these variables appear in Table 1.

Table 1:
Satisfaction Ratings (1-7) Dependent on Currency and Outcome Type

	Athletic Shoes		Restaurant	
Valence of Outcome	**Money**	**Time**	**Money**	**Time**
Positive Experience	6.2	5.5	6.0	5.1
Negative Experience	1.8	2.1	1.6	1.9
Difference	4.4	3.4	4.4	3.2

There is an obvious main effect of outcome type, where positive outcomes are rated as more satisfying than negative ones, $F_{1,356}=2742$, $p<.0001$. Our main prediction, based on the inherent ambiguity in the value of time, was that the difference in the overall satisfaction levels between the positive and negative consumption outcomes would be greater when paying with money than time. The significant interaction currency by outcome interaction supports this prediction, $F_{1,356}=32.3$, $p<.0001$. This significant interaction indicates that, as predicted, the difference between positive and negative outcomes is greater when paying with money (m=4.4) compared to paying with time (m=3.3). For both product scenarios, when people paid $50 in cash and had a positive experience, they were significantly more satisfied than when they paid with 4 hours of time completing a market research study (both p's<.01). In contrast, when people paid $50 in cash and had a negative experience, they were significantly less satisfied than when they paid with 4 hours of time completing a market research study (both p's<.01). Paying with time attenuates the ex post satisfaction that subjects express for both positive and negative outcomes.

To get a better handle on the underlying process, we examined the monetary equivalents for 4 hours work provided by subjects in the time conditions. The data appear in Table 2.

Table 2:
Monetary Equivalents for Four Hours of Work

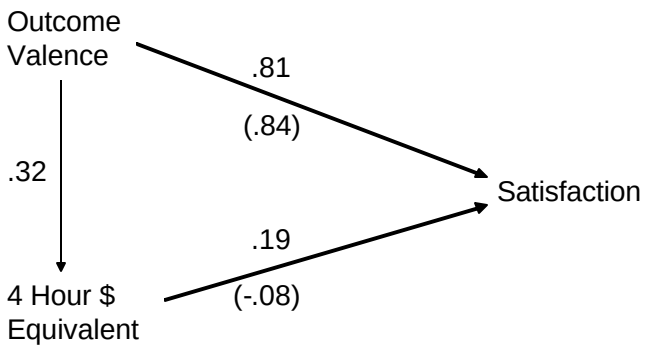
Valence of Outcome	Athletic Shoes	Restaurant
Positive Experience	$82.67	$81.80
Negative Experience	$57.91	$56.18

As can be seen, subjects ex post value their time at over $20/hour when their 4 hour time expenditure was spent in service of a positive outcome, but when the outcome is less satisfying that same 4 hour investment is worth less than $15/hour. This 44% wage

premium accompanying positive over negative outcomes is statistically significant, F=43.2, p<.0001. It is worth pointing out that all of these money equivalents are greater than the 4 hours that subjects were willing to spend for $50 indicated in the pretest. One possible reason for this is that the question posed here was willingness to accept/sell rather than willingness to pay/spend question.

Of course we did not predict that the level of satisfaction with the positive outcome would be higher when paying with money than time, only that the difference in satisfaction between positive and negative outcomes would be attenuated with time payments. We conducted a simple path analysis to examine the interrelationships between the valence of the outcome, the 4 hour dollar equivalents, and satisfaction. The results appear in Figure 1. The numbers are standardized coefficients and all of them are significant at p<.02. The coefficients in parentheses come from the multiple regression of satisfaction onto valence and dollar equivalent. As can be seen, valence has a positive influence on both satisfaction (.81) and dollar equivalents (.32). It is also the case that the simple relationship between dollar equivalents and satisfaction is positive (.19), as previously shown in Table 2. After controlling for valence, however, we see a small negative impact of dollar equivalent on satisfaction (-.08), suggesting the simple positive relation is spurious.

Figure 1: Relationships Between Valence, $ Equivalents, and Satisfaction



This makes sense since satisfaction should decrease as one pays more holding constant the consumption experience. It also provides insight into the observed attenuation in satisfaction observed when paying with time which can be more flexibly valued compared to when paying with a more fixed valued currency like money.

The data show that time attenuates and/or money amplifies the happiness or unhappiness that consumers feel after consumption. These effects occurred irrespective of the need to justify a decision (lack of any effect due to group vs. individual decision) or whether subjects were alerted to the costs of time (busy week of tests). We acknowledge that these two manipulations might have been weak but this does suggest that the results are somewhat robust. After spending time and ending up with a negative outcome, subjects are flexible in valuing their time and can increase their level of satisfaction by lowering their implicit wages rates by over 40%. Verbal protocols support this reasoning. Examples of protocols from subjects who paid in time for a negative outcome generally contained rationalizations such as:

- It cost me no money, just time;
- At least I didn't pay money;
- Even though the shoes suck (sic), they were free in monetary terms, and I took only 4 hours.

A positive outcome leads people to infer a higher value for their time to match their greater satisfaction with the outcome. People who have paid money for the positive outcome end up being the most satisfied, probably due to self-perception and ego bolstering for making a high return on their initial $50 investment. Protocols from people who paid in money and received a positive outcome support this self-perception process:

- If the shoes are awesome, $50 is hardly a cost;
- The money is a small factor when the service and food are superior;
- I love food. $50 for a great dinner is totally worth it.

Experiment 2

The first study provides support for our prediction that people have an easier time accommodating positive and negative purchase outcomes when paying in a more flexibly valued currency like time compared to when paying with a more fixed value currency like money. The purpose of this next study is to determine if it is indeed the ambiguity of the value of a currency that drives the observed effect. To do this, we manipulated the ambiguity of the value of money. We introduced a hypothetical foreign currency, E, and used it as the monetary unit instead of US$. In the ambiguous volatile condition, the exchange rate between US$ and E was highly variable. Subjects were told that they had exchanged US dollars for E twice in the past year, once at E = $0.80, and once at E = $1.20. The current exchange rate was E = $1.00, with some analysts predicting an appreciation to E = $1.50 in next month or two, and others predicting a devaluation to E = $0.50. In the fixed condition, the exchange rate was fixed at E = $1.00. Because the value of money is more ambiguous in the volatile condition than the fixed, our prediction is that having paid in a higher variance currency should attenuate the overall merit of the transaction in a manner similar to time. Our manipulation of the ambiguity of money is similar in spirit to that of Soman (2001) who showed that people treat sunk costs after paying with time the same as when paying money when their wage rate is made salient.

Method

One hundred and eighty undergraduate students participated in this study. The method duplicated experiment 1 with two differences. First, there were three levels of currency, which were time, volatile E, and fixed E. We used the same basic design of crossing a Latin square with a between subject factor, but in the design of experiment 2, the Latin square crossed the two products with consumption experience, and the between subjects factor was type of currency.

Results

The data appear in Table 3.

Table 3:
Satisfaction Ratings (1-7) Dependent on Currency and Outcome Type

	Restaurant			Athletic Shoes		
Valence of Outcome	**Fixed Currency**	**Volatile currency**	**Time**	**Fixed Currency**	**Volatile currency**	**Time**
Positive Experience	6.3	6.1	5.4	6.2	5.6	5.5
Negative Experience	1.6	1.9	2.3	1.8	2.1	2.3
Difference	4.7	4.2	3.1	4.4	3.5	3.2

As before we found a main effect of outcome type, where positive outcomes are rated as more satisfying than negative ones, $F_{1,168}=546.0$, $p<.0001$. Now with three levels of currency, we duplicated the significant currency by outcome interaction, $F_{2,168}=6.07$, $p<.003$. Across the two product scenarios, the difference between positive and negative outcomes was greatest for the fixed currency ($m=4.55$), next largest for the volatile currency ($m=3.85$), and smallest when paying with time ($m=3.15$). These three differences all are significantly different from each other, p's<.03. The data clearly show that the ambiguity of the currency, in increasing order from fixed foreign currency to volatile foreign currency to time, attenuates the happiness or unhappiness that consumers feel after consumption.

Discussion

Experiment 1 sheds light on how individuals value money and time as currencies of exchange. Even when the usage experience is described in the same positive (negative) way, how satisfied (dissatisfied) individuals feel about the overall exchange transaction depends on whether they paid for the product in time or money. Furthermore, Experiment 2 validated our assumption that the ambiguity of the value of time facilitates this difference in satisfaction. When the ambiguity of the value of money is increased, individuals start accounting for expenditure in a volatile currency more like they would account for that expenditure when paying with time. Our results demonstrate that the

valuation of time expenditures is more flexible than the valuation of monetary expenditures, and the value of expenditures in ambiguous currencies is derived at least in part from the usage experience. If the consumption experience is positive, individuals infer a greater value to the time spent in the exchange transaction, and if the experience is negative, they infer a lesser value to the same amount of time. The same goes for monetary expenditures of ambiguous value, to a lesser extent. Furthermore, this effect does not go away when the need for self-justification is reduced, or when the urgency of time is made more salient. This suggests that the flexibility in the valuation of time is driven not so much by individuals' motivation for justifying negative experiences, but rather by the intrinsic ambiguity of time and the mechanisms that individuals employ to reduce that ambiguity.

Experiment 3

The first two studies illustrated the differential ex post valuation of time and money as units of expenditure. Paying in time instead of money ends up working like an insurance policy against a negative consumption outcome. In experiments 3-4 we now go on to examine whether or not individuals can anticipate this distinction between time and money at the time of purchase, and a priori choose to pay in time and effectively buy insurance when the expected consumption experience is uncertain, and choose to pay in money and effectively save the cost of buying insurance when the expected consumption experience is relatively certain.

Using simple lotteries where we hold constant expected value, we predict that people will display a greater preference for higher variance and therefore higher risk gambles when paying with time rather than when paying with money. If people are more flexible in their thinking about the value of time, then they should be willing to pay more for higher variance gambles that offer a lower probability of winning a larger amount. With time if they win, then great, and if they lose then it is only a limited waste of time, not hard cash.

Rottenstreich and Hsee (2001) compared people's risk preferences for receiving affective rich (kisses, vacations, electric shocks) stimuli to those for money. Subjects were less sensitive to probabilities when setting willingness-to-pay and willingness-to-avoid prices for non-cash as to compared to monetary outcomes. They argue that people prefer affect rich stimuli at low probabilities whereas at high probabilities they prefer money due to the strength of imagery-induced emotions. Similarly Rettinger and Hastie (2001) found risk aversion with gambles but risk seeking the same problem was imbedded in a different content domain (e.g., traffic tickets). Although there are differences in the task we used in Experiments 3-4, in a similar vein, we expected people to be less sensitive to probabilities when paying with time rather than money.

Method

Three hundred and sixty-three undergraduate students participated in the experiment, which was conducted as a pencil and paper questionnaire. The subjects were presented with six lotteries, and were asked to indicate their willingness to pay (WTP) in time (number of hours and minutes) and then in money (dollars) for each, a total of twelve measures from each subject. For the time based WTP measure, subjects were told that they would be completing research assistant work (data coding, data entry) related to a market research project. A short filler task separated the two sets of judgments. A subset of 90 subjects provided their initial set of 12 WTP judgments, completed about ½ hour of unrelated pencil and paper experiments, and then made the same 12 WTP judgments a second time. This allowed us to investigate test-retest reliability for both time and money judgments.

The six lotteries varied in expected value (E(V)) and risk as shown in Table 4. Three of the lotteries had an E(V) of $50, and the other three had an E(V) of $100. At each level of E(V), there were three ranges of outcomes. The highest variance lotteries offered 20% chance of winning something and the winning payoff was the highest, but an 80% chance of winning nothing at all. The medium risk lotteries had a 50% chance of

winning something, and a 50% chance of winning nothing at all. The lowest risk lotteries had an 80% chance of winning something but the winning payoff was low, and only a 20% chance of winning nothing.

Table 4:
Lotteries Varying in Terms of Expected Value and Variance in Payoffs

	Expected Value	
Range of Outcomes	**$50**	**$100**
Low	.2*0+.8*$62.50	.2*0+.8*$125
Medium	.5*0+.5*$100	.5*0+.5*$200
High	.8*0+.2*$250	.8*0+.2*500

The presentation order between time and money, as well as the order among the six lotteries were randomized.

Results and Discussion

We analyzed the WTP data using a repeated-measures ANOVA. WTP in both time and money currencies served as the dependent variable with expected value (E[V]=$50 or $100) and variance in outcomes (low, medium, high) as the other design variables. All the data were within subjects. In order to deal with the different scale properties (mean and variance) of the money and time measures, we separately transformed the time and money data into z-scores using the mean and standard deviation calculated across lotteries and subjects. This of course eliminates the main effect of currency since the grand mean of both is rescaled to zero but it also resulted in data that did not violate the homogeneity of variance assumption. The results were very similar when analyzing the raw data. The raw data are displayed in Table 5.

Table 5:
WTP in Money and Time for Experiment 3

	EV=$50		EV=$100	
Variance in Outcomes	**WTP ($)**	**WTP (Min)**	**WTP ($)**	**WTP (Min)**
Low	18.13	78.1	34.27	110.3
Medium	18.42	89.5	33.67	128.2
High	16.68	98.1	28.68	154.4

The key effect is the interaction of currency and variance in outcomes which is quite significant, $F_{2, 362}$=30.3, p<.0001. The key driver of this interaction a significant linear contrast across the 3 levels of variance in outcomes, $F_{1, 362}$=36.3, p<.0001. Follow up simple effects tests showed that the interaction occurred because subjects became relatively more risk averse as the variance of the gambles increased when paying with money, $F_{2, 362}$=3.9, p<.01, whereas they became more risk seeking with higher variance gambles when paying with time, $F_{2, 362}$=15.1, p<.0001. There also was a significant 3-way interaction between currency type by E(V) by variance in outcomes, $F_{2, 362}$=16.1, p=.0001. This interaction was driven by the fact that risk aversion increased more for higher variance gambles with higher EV when paying with money whereas when paying with time the exact opposite occurred – subjects became more risk seeking with higher variance outcomes with greater EV.

Examination of the WTP judgments with money shows that subjects display the standard risk aversion found with these types of gambles. On average subjects were willing to pay only about 1/3 of the actual expected value of each of the gambles. Moreover, as the variance in outcomes increased, subjects became even more risk averse. For lotteries with an E(V) of $50, the WTP in money decreased 8% when comparing the high variance to the low variance gambles. Likewise for those lotteries with an E(V) of $100, the WTP in time decreased 16% when comparing the high variance to the low variance gambles. A simple 2-way interaction of EV with variance suggests that the 16% decrease in WTP for E(V)=100 gambles is greater than the 8% decline for E(V)=50 gambles, $F_{2, 362}$=4.2, p=.04.

The WTP in time results are almost the mirror image of those for WTP in money. As the variance in outcomes increased, subjects became more risk seeking. For lotteries with an E(V) of $50, the WTP in time increased 26% when comparing the high variance to the low variance gambles. For lotteries with an E(V) of $100, the WTP in time increased 40% when comparing the high variance to the low variance gambles. As with the money WTP data, a simple 2-way interaction of EV with variance suggests that the 40% increase in WTP for E(V)=100 gambles is greater than the 26% increase for E(V)=50 gambles, $F_{2, 362}=13.6$, $p<.001$.

Although these subjects displayed increased risk aversion to higher variance gambles when asked to play with money, a standard result with the magnitude of the lotteries that we utilized, they displayed increased risk seeking behavior for higher variance gambles when paying with time. It was almost as if paying with time was like playing with someone else money. If they win the high variance gamble, they can treat it as a big windfall and if they lose it only costs them a little time. When paying with money, they ex ante anticipate the regret that they will feel if they lose the higher variance gamble, which is pretty likely (80% chance).

For the subset of 90 people who provided two sets of time and money WTP judgments, we calculated two individual-level correlation coefficients, one for time and one for money. Subjects displayed significantly greater reliability expressing their WTP in money (average r=.69) compared to time (average r=.55). A pair-t-test (t=2.5) on the correlations (after Fisher's r to z transformation) revealed that the difference was statistically significant, though both sets of judgments display a reasonable level of reliability. We actually were a bit surprised that people were as proficient using the time scale, since the direct mapping between the outcomes (expressed in dollars) and time is less transparent. Possibly we would have seen more degradation in judgmental consistency of the time based WTP's if there had been a long delay between the two sets of ratings.

Experiment 4

The findings of the previous experiment 3 suggest that individuals tend to be risk averse in money, but risk taking in money, for lotteries that pay out in money. The purpose of experiment 4 was to rule out the possibility that this somehow could have been an artifact due to the congruence or compatibility of the reward currency ($ gambles) with the measurement of WTP in money but not with time (e.g., Fischer and Hawkins 1993; Tversky, Sattath, and Slovic 1988). Therefore we conducted this study to replicate our findings using lotteries with non-monetary rewards.

Method

In a pretest of 42 subjects, we first approximated the perceived value of two types of products: airline tickets and television sets. The purpose was to create sets of lotteries of comparable expected value, and varying risk, using non-monetary payoffs. We asked the subjects to estimate the value of three alternatives for each product category. For the airline tickets, the three alternatives (and their respective average values) in order of increasing value were a round-trip economy class ticket to any West Coast destination from another West Coast city where the pretest was conducted ($225), a round-trip economy class ticket to any destination in the lower 48 states ($360), and a round-trip economy class ticket to any destination in North America including Hawaii and the Caribbean ($505). For the television set, the three alternatives (and their respective average values) in increasing order of value were a 19-inch screen television ($181), a 24-inch screen ($261), and a 36-inch screen ($438).

From these pretest data, we created high, medium, and low risk lotteries of comparable expected value using airline tickets and television sets as payoffs. The strict equality of the expected values across the three lottery types within a product class is not necessary, so we used round numbers for winning percentages of all six lotteries. Table 6 summarizes the stimuli.

Table 6:
Non-Monetary Lotteries of Varying Expected Values and Payoffs

	Expected Value	
Range of Outcomes	**Airline Ticket**	**Television Set**
Low	80% * West Coast + 30% * Nothing	70% * 9" Screen + 30% * Nothing
Medium	50% * Lower 48 + 50% * Nothing	50% * 24" Screen + 50% * Nothing
High	35% * No. America + 65% * Nothing	30% * 36" Screen + 70% * Nothing

Eighty-one undergraduate students participated in the study. For each of the six lotteries, three each involving airline tickets and televisions sets of comparable expected value and varying risk, we measured the subjects' WTP first in time and then money or in the reverse order. Additionally we measured the perceived scarcity of time. On a scale of 1 (strongly disagree) to 7 (strongly agree), we asked the subjects to indicate to what extent they agreed with the statement that they had a lot of time to spare.

Results

The data appear in Table 7 with WTP as the dependent variable and currency, risk, product type and their interactions as the independent variables.

Table 7:
WTP in Money and Time for Experiment 4

	Airline Ticket		Television Set	
Variance in Outcomes	**WTP ($)**	**WTP (Min)**	**WTP ($)**	**WTP (Min)**
Low	69.70	179	40.70	168
Medium	51.90	227	36.90	172
High	41.50	333	35.10	180

Again, the key effect is the 2-way interaction between currency and risk which is statistically significant, $F_{2, 160}=36.3$, $p<.0001$. Polynomial contrasts indicate that the interaction is driven by opposite linear trends when paying with time or money, $F_{1,}$

$_{160}$=27.2, p<.0001. As the variance (risk) of an outcome increases, individuals are willing to pay less with money but more with time. This suggests that relative risk aversion in money and risk seeking in time is generalizable to non-monetary lotteries as well. Follow-up simple effect tests of variance in outcomes within currency indicates that the decrease in WTP with money is significant, $F_{2, 160}$=5.4, p<.01, as is the increase in WTP with time, $F_{2, 160}$=45.0, p=.0001. The significant three-way interaction between currency, risk, and product, $F_{2, 160}$=11.5, p<.0001), suggests that the magnitude of both the relative risk aversion in money and risk seeking in time were greater for airline tickets than for television sets. Inclusion of each subjects' perceived scarcity of time had no influence on the above pattern of results.

Discussion

The results of experiments 3-4 suggest that individuals distinguish between the fixed valuation of money and adjustable valuation of time a priori, and choose between the two currencies accordingly at the point of making the purchase decision. If individuals expect a high variance in the outcome, they prefer to pay in time, anticipating that in the case of a negative outcome, paying in time would mitigate the dissatisfaction that they would feel with the overall exchange transaction. In doing so, individuals effectively buy an insurance policy against negative consumption outcomes, similar to Thaler and Johnson's (1990) demonstration of how playing with house money affects risky choice. When the outcome is reasonably certain, insurance against a bad outcome is not as necessary and paying in money makes sense. The next experiment looks at another case of how individuals match the flexibility of currency valuation to different expected outcomes.

Experiment 5

Experiment 5 measured how individuals choose between paying in time and paying in money for enriched versus impoverished alternatives. An enriched alternative has more positive as well as negative attributes compared to an impoverished alternative

(Shafir 1993). There are more attribute trade-offs associated with an enriched alternative, and thus the consumer may perceive the outcome to be more uncertain. Building on the previous argument regarding certain versus uncertain outcomes, the prediction is that individuals would have a relative preference to pay in time over money for enriched alternatives, and a relative preference to pay in money over time for impoverished alternatives.

Method

Three hundred sixty subjects completed the experiment in fulfillment of a class requirement. Two different product categories were selected: personal digital assistants (PDA) and digital cameras. For each of the product categories, we constructed alternatives described on 6 attributes. Using the procedure described in Shafir (1993), we constructed alternatives with either low or high variance across the levels of each of the attributes. Shafir referred to these as either impoverished (low variance) or enriched (high variance) alternatives. An example for digital cameras appears below in Table 8. Brand A is average on all attributes whereas Brand B is outstanding on some and weak on other attributes. Brand B offers some upside potential on some attributes but there is also some downside risk due to weak ratings on other attributes. The design was completely between subjects. In the context of an experimental session with other unrelated tasks, each subject saw one of the four possible multi-attribute product descriptions (2 product categories, either impoverished or enriched) and indicated their willingness to pay in either money or in time (hours spent doing the data entry task described earlier).

Table 8:
Sample Stimuli for Experiment 5

Attribute	Brand A	Brand B
Image quality	5	10
Compactness	5	2

Features	5	9
Ease of use	5	1
Warranty	5	3
Durability	5	8

Results and Discussion

The results are displayed in Table 9. As can be seen, when people indicate their willingness to pay with money, they place higher value on low variance compared to high variance options. Average on all dimensions looks more attractive to subjects than being strong on some and weak on other attributes. On average, higher variance options are valued at about 80% of the low variance options. In contrast when paying with time, subjects are willing to pay 30% more for the higher variance option. These observations are confirmed by the significant variance in attribute rating by WTP in time versus money interaction, $F_{1,352}=20.0$, $p<.0001$. The simple effects of attribute rating variance are significant for both time and money (both p's<.05), though obviously in the opposite direction from each other.

Similar to our findings in experiments 3-4, this study shows that people systematically spend money differently than they spend time when faced with alternatives that differ in their level of risk or certainty of the outcome. People place a higher value on riskier options when paying with time; the opposite occurs when they pay with money, whether the alternatives are traditional two outcome gambles or multiattribute products. These results suggest that the larger ex ante valuations that consumers place on riskier alternatives may occur because subjects realize that they will have an easier time rationalizing a potentially bad outcome after paying with time than hard earned cash. In this sense, paying with time is similar to executing a covered option in the financial markets to limit downside risk. Time offers option value because people can renormalize time more easily than money after finding out what happens.

Table 9: WTP for High and Low Variance Alternatives with Time versus Money in Experiment 5

	PDA		Camera	
Attribute Ratings	**Money**	**Time**	**Money**	**Time**
Low Variance	$175	4.9 hrs	$161	2.9 hrs
High Variance	$118	5.2 hrs	$148	4.5 hrs

General Discussion

Money is the most ubiquitous form of currency used in exchange transactions. It is not, however, a requisite in exchange transactions and long before money was institutionalized, goods were exchanged among people in the form of barter. In certain parts of the world money-less exchanges exist as the dominant form of trade even today. In modern economies, however, consumers are accustomed to transacting primarily in money, and have been trained in its valuation through cumulative exchange experiences. As such academic research on exchange has focused almost exclusively on money-based transactions. This research aimed to take a more comprehensive approach to exchange transactions by exploring another form of currency: time. Non-monetary expenditures have been incorporated into microeconomic models, but the basic approach there has been to assign monetary values to non-monetary currencies, and analyze exchange transactions based on the assumption that rational agents consider all currencies equivalently. Though this monetary conversion serves as a tool for simplification, it does not fully capture differences in the underlying psychology.

The intrinsic difference between time and money as currencies of exchange lies in the estimation of the respective opportunity costs. Money is highly liquid and storable for future use, which makes the estimation of opportunity cost relatively straightforward and consistent over time and context. Time, on the other hand, is not as liquid and furthermore highly perishable which makes the opportunity cost more difficult to

estimate and more dependent on context. The valuation of money remains relatively fixed while the valuation of time is flexible. When expenditures are made in time, we found that individuals infer its ambiguous value by referencing other less ambiguous cues, such as usage experience. Individuals also appear to appreciate this difference in the valuation of the two currencies a priori, and choose their currency of payment accordingly upon product acquisition. When the outcome of the usage experience is uncertain, individuals prefer to pay in time, which would partially protect them from the downside.

When consumers spend their own time rather than their own money, they benefit from a built-in insurance policy in the sense that they can fairly easily rationalize both lower and higher implicit wage rates. This flexibility in valuing one's time influences: (a) ex ante decisions because consumer anticipate that they will have an easier time rationalizing and writing off bad outcomes if thy occur; and (b) ex post decisions because consumers accommodate to whatever they get by adjusting the value of their temporal inputs.

An interesting question is whether people spend money or time more wisely. The answer at this point is not so clear. Spending time confers option value because we can spend cheap time or valuable time depending on the circumstances. Sometimes this can make us happier after the fact and motivate us to take some risks that we would not if money were the required currency. Whether the built-in flexibility and ambiguity that characterizes the expenditure of time is normatively correct largely comes down to the actual opportunity costs of time. For most people, one's wage rate is only a rough indicator of the value of any specific period of time. Weekend time does not have the same value as normal working hours or overtime or time spent resting or on vacation. The reason that the value of time is flexible is because in many situations we have a large measure of discretion. Whenever we are a distance away from the temporal budget constraint, we have plenty of degrees of freedom in how to go about wasting our spare

time. The flexibility that people have in spending time may serve a role in maintaining our psychological immune system (Gilbert et al 2000; Gilbert and Ebert 2002).

The limitations of the current research suggest directions for future work. Since all of our experiments involve undergraduates at US universities who presumably have low opportunity costs (though they surely complain a lot about how busy they are) and are not likely to be as experienced at valuing their time as certain professionals, it would be interesting to study other populations, both here in America and in other cultures. For example, Europeans, as witnessed by their long summer vacations, may value time more dearly; alternatively, people brought up in certain eastern religions (e.g., Buddhism) may think about time and money very differently. There may also be people in different economic circumstances that are much more practiced at bartering their time rather than their money. Travels in India suggest that opportunity costs for many people are very low and this may alter how people spend time and money. In a related fashion, it would be interesting to study situations where people normally spend time rather than money (waiting in line, letting wine age in the cellar, watching a tree grow) and see whether the current findings would generalize or a different pattern would obtain.

References

Becker, Gary S. (1965), "A Theory of the Allocation of Time," Economic Journal, 75 (September), 493-517.

Carlson, John A. and Robert J. Gieseke (1983), "Price Search in a Product Market," Journal of Consumer Research, 9 (March) 4, 357-365.

Fischer, Gregory and Scott Hawkins (1993), "Strategy Compatibility, Scale Compatibility, and the Prominence Effect," Journal of Experimental Psychology: Human Perception and Performance, 19(3), 580-597.

Franklin, Benjamin (1748), Advice to a Young Tradesman.

Gilbert, Daniel T., Ryan P. Brown, Elizabeth C. Pinel, and Timothy D. Wilson (2000), "The Illusion of External Agency," Journal of Personality and Social Psychology, 79 (5), 690-700.

Gilbert, Daniel T. and Jane E.J. Ebert (2002), "Decisions and Revisions: The Affective Forecasting of Changeable Outcomes," Journal of Personality and Social Psychology, 82 (4), in press.

Hoch, Stephen J. and Young-Won Ha (1986), "Consumer Learning: Advertising and the Ambiguity of Product Experience," Journal of Consumer Research, 13 (September), 221-233.

Hoskin, R.E. (1983), "Opportunity Cost and Behavior," Journal of Accounting Research, 21, 78-95.

Hsee, Christopher K. (1995), "Elastic Justification: How Tempting but Task-Irrelevant Factors Influence Decisions," Organizational Behavioral and Human Decision Process, 62, 330-337.

_____ (1996), "Elastic justification: How Unjustifiable Factors Influence Judgments," Organizational Behavior and Human Decision Processes, 66, 122-129.

Larrick, Richard P., James N. Morgan, and Richard E. Nisbett (1990), "Teaching the Use of Cost-Benefit Reasoning in Everyday Life," Psychological Science, 1 (6), 362-370.

Marmorstein, Howard, Dhruv Grewal and Raymond P.H. Fishe (1992), "The Value of Time Spent in Price-Comparison Shopping: Survey and Experimental Evidence," Journal of Consumer Research, 19 (June), 52-61.

Neumann, B.R. and L.A. Friedman (1980), "The Effects of Opportunity Costs on Project Investment Decision: A Replication and Extension," Journal of Accounting Research, 18, 407-419.

Rettinger, David A. and Reid Hastie (2001), "Content Effects on Decision Making," Organizational Behavior and Human Decision Processes, 85 (2), 336-359.

Rottenstreich, Yuval and Christopher K. Hsee (2000), "Money, Kisses, and Electric Shocks: On the Affective Psychology of Risk," Psychological Science, 12 (3), 185-190.

Shafir, Eldar (1993), "Choosing versus Rejecting: Why Some Options Are Both Better and Worse Than Others," Memory & Cognition, 21 (4), 546-555.

Soman, Dilip (2001), "The Mental Accounting of Sunk Time Costs: Why Time is not Like Money," Journal of Behavioral Decision Making, 14 (3), 169-185.

Stigler, George J. (1961), "The Economics of Information," Journal of Political Economy, 59 (June), 213-225.

Taylor, Shirley (1994), "Waiting for Service: The Relationship Between Delays and Evaluations of Service," Journal of Marketing, 58 (April), 56-69.

Thaler, Richard H. (1980), "Toward a Positive Theory of Consumer Choice," Journal of Economic Behavior and Organization, 1, 39-60.

Thaler, Richard H. (1999), "Mental Accounting Matters," Journal of Behavioral Decision Making, 12,183-206.

_____ and Eric J. Johnson (1990), "Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choices," Management Science, 36 (June), 643-660.

Tversky, Amos, S. Sattath, and Paul Slovic (1988), "Contingent Weighting in Judgment and Choice," Psychological Review, 95(3) 371-384.

Whyte, Glen (1991), "Diffusion of Responsibility: Effects on the Escalation Tendency," Journal of Applied Psychology, 76 (3) 408-415.

Winer, Benjamin J. (1971), Statistical Principles in Experimental Design 2nd ed. New York, NY: McGraw Hill Publishing Company.