The Value of Time

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Contribution Statement

A great deal of empirical evidence has demonstrated that the value function is concave for gains and convex for losses (e.g., Thaler 1985). However, the vast majority of the evidence supporting this conclusion has relied on monetary judgments. We propose that studying alternative resources, namely time, may allow us to observe a more nuanced value function. We find that the valuation of time conforms to a double-kinked value function: small gains and losses are valued in line with increasing marginal utility, while large gains and losses are valued in line with decreasing marginal utility. To our knowledge, this is the first empirical evidence of double-kinked value function in the domain of riskless choice. Our results add to an emerging stream of literature that shows a discrepancy in the way consumers deal with time versus monetary resources (Okada and Hoch 2004; Saini and Monga 2008; Zauberman and Lynch 2005).

Abstract

Prior research on monetary resource valuation has shown that there are diminishing marginal benefits for gains and diminishing marginal costs for losses. The only exception to this rule seems to be small monetary gains and losses, wherein the value function occasionally reverses (i.e., there are increasing marginal benefits for gains and increasing marginal costs for losses). We posit that the valuation inconsistencies that are observed with small amounts of money imply a double-kinked value function. Moreover, this double-kinked value function should be more observable when people are less sensitive to changes in the availability of a resource. We posit that time is a resource to which people are more insensitive. Across a series of studies, we show (1) small time gains can show increasing marginal utility and small time losses can show increasing marginal disutility, (2) small time gains can show increasing marginal

utility and large time gains can show decreasing marginal utility, (3) small time losses can show increasing marginal disutility and large time losses can show decreasing marginal disutility.

People make multiple time-related decisions each day. They allocate time to the pursuit of goals, engage in activities that have different time commitments, and make trade-offs between the productive use of time and relaxation. Making these time-allocation choices efficiently is increasingly important in societies that value productivity and leisure (Leclerc, Schmitt and Dubé 1995, Okada and Hoch 2004). For many, time is not just *a* scarce resource, it is *the* scarce resource. Time is a resource that must be managed.

Despite the importance of time in daily life, our current understanding of the value of time remains limited. In economics, it is often assumed that the value of time can be derived from the value of money (i.e., "time is money"), hence, time-based decisions should abide by the same principles as monetary decisions (Becker 1965; Borjas 1996, p. 21). This implies that people will make the same choice when alternatives are described using monetary units or time units. The fact that consumers can buy time-saving products and services may also have contributed to the widespread belief that time can be expressed in monetary equivalents (Bivens and Volker 1986; Graham 1981). For instance, consumers buy products that increase efficiency (e.g., organizational tools), enhance productivity (e.g., technology), and extend life (e.g., fitness and health products).

Contrary to the economic literature, research in psychology suggests that people treat time and money differently (Leclerc et al. 1995). For instance, Okada and Hoch (2004) find that when individuals pay in time rather than money, they display greater willingness to pay for high risk/high return options. Zauberman and Lynch (2005) find that people project greater slack in time than money, thereby leading to smaller discounts in their future outlay of time versus money. Consistent with this view, Soman (2001) finds that the influence of monetary sunk costs far exceeds that of time sunk costs, which are often non-existent. Finally, Saini and Monga

(2008) find that time-based decisions are more likely to be based on quick-and-easy heuristics, whereas monetary decisions tend to rely on a more thorough analysis of the available information.

We posit that the fundamental difference between time and money is that time is less "fungible" than money (Leclerc et al. 1995). The low fungibility of time implies a person will repeatedly experience difficulties in allocating time to activities that would yield maximal marginal utility. A person will become used to gaining (i.e., allocating too much time) and losing (i.e., allocating too little time) small amounts of time and, consequently, will value these small amounts of time differently than more substantial time periods. We hypothesize that small time gains will show increasing marginal utility, reflecting the idea that time gains must be substantial enough to afford allocation of time to another activity. Once time gains become substantial, they will show decreasing marginal utility, similar to the value function for monetary gains. We also hypothesize that small time losses will show increasing marginal disutility, reflecting the idea that time losses must be substantial enough to prohibit allocation of time to another activity. Once time losses become substantial, they will show decreasing marginal disutility, similar to the value function for monetary losses.

Our hypotheses about time can be formally described using a double-kinked value function. As shown in figure 2, small time gains (losses) should show increasing marginal utility (disutility), whereas large time gains (losses) should show decreasing marginal utility (disutility). We provide evidence for these claims in three ways. First, we document that people prefer to aggregate small time gains and segregate small time losses, in direct conflict with the predictions of the value function of prospect theory (Thaler 1985; Tversky and Kahneman 1991). Second, we show that the preference to aggregate small time gains reverses as time gains become larger and the preference to segregate small time losses reverses as time losses become larger. Third, we show that the preference to aggregate (segregate) small time gains (losses) reverses when time is expressed in a monetary equivalent. We begin with a discussion of how people value resources.

THE VALUE OF A RESOURCE

Reference Dependence Model

Prospect theory (Kahneman and Tversky 1979) has been successfully used to predict how people will respond to resources gains and losses in risky choice situations (for a review see Camerer 2000). When gains and losses are studied in the context of riskless choice and/or evaluation, prospect theory simplifies to the reference dependence model (Tversky and Kahneman 1991). The reference dependence model has three basic assumptions. First, a value function defines the utility derived from gains and losses relative to a reference state instead of an absolute state (i.e., reference dependence). For example, increasing an employee’s monthly salary from $1,500 to $1,600 will be encoded as a gain of $100 (a positive outcome relative to the referent state) rather than a salary of $1,600 (a positive outcome in absolute terms). Second, the value function assumes diminishing marginal benefits for gains (i.e., concavity) and diminishing marginal costs for losses (i.e., convexity) (see Figure 1). For example, an isolated gain (loss) of $10 is more (less) pleasurable (painful) than a gain (loss) of $10 after having gained (lost) $100. Third, the value function is steeper for losses than for gains (i.e., loss aversion) (see Figure 1). That is, a loss yields more pain than an equally-sized gain yields pleasure. The reference dependence model has received considerable support in the simple choice (Kahneman and Tversky 2000), multiattribute choice (Tsetsos, Usher, and Chater 2010), and pricing (Janiszewski and Cunha 2004; Winer 1986) literatures.

The value function has been used to explain consumer preferences for the integration and segregation of riskless gains and losses (Thaler 1985). To illustrate, consider the losses A and B and the gains G and H shown in figure 1. The concavity of the gain portion of the value function predicts that people should prefer to segregate gains (e.g., two G gains are valued at 6) rather than integrate gains (e.g., one H gain, the equivalent of two G gains, is valued at 4) (Linville and Fischer 1991; Thaler 1985; Thaler and Johnson 1990). For example, Thaler (1985) found that people anticipated experiencing more happiness if they won two lotteries than if they won a single lottery for the combined amount. Mazumdar and Jun (1993) found that people expected to be happier if they received a price discount to each component of a bundled product than if they received an integrated discount to the bundle. Linville and Fischer (1991) found that people expected to be happier if they experienced two benefits (e.g., financial, social, academic) on separate days, a form of gain segregation, than if they received the benefits on the same day.

According to the value function, people should also prefer to integrate losses (one A loss, the equivalent of two B losses, is valued at - 6) rather than segregate losses (e.g., two B losses are valued at -8) (Linville and Fischer 1991; Thaler 1985). In support of the hypothesis, Thaler (1985) found people expected to be less upset if they experienced an unexpected, aggregate tax loss than if the tax losses were spread across federal and state income taxes. Mazumdar and Jun (1993) found that people expected to be less upset if a price premium was charged to an entire bundle than if it was allocated across items in a bundle. Heath, Chatterjee, and France (1995) found that people expected to be less upset if they faced a price increase on only one product than if they encountered a price increase (of half the magnitude of the larger one) one two different products.

Double-kinked Value Function

Harry Markowitz (1952) proposed the double-kinked value function to help account for how people respond to risky gambles. Markowitz proposed that people evaluate gains and losses using a value function with three, rather than two, inflection points (Figure 2). Markowitz did not empirically test his hypothesis, but provided a thought experiment to support his position. Markowitz asked readers to consider a series of gambles with 10 to 1 odds. For example, a person could be offered a certain gain of $.10 or a 10 percent chance of earning $1. Additional gambles increased in size by factors of 10: $1 certain or 10% chance of $10, $10 certain or 10% chance of $100, $100 certain or 10% chance of $1000, … $1,000,000 certain or 10% chance of $10,000,000. Markowitz argued that most individuals would take the gamble at lower amounts, but take the certain payout at higher amounts, a prediction subsequently confirmed by Weber and Chapman (2005). When the same gambles were offered in the loss domain, most individuals should take the certain loss at low amounts, but take the gamble at higher amounts. Markowitz proposed that these preferences were consistent with a double-kinked value function and offered insight into why "… the same individual will buy insurance and lottery tickets. He will take large chances of a small loss for a small chance for a large gain" (Markowitz 1952, p. 155).

Although Markowitz proposed a value function that could explain risky choices (e.g., insurance, lotteries), his model can be used to make predictions about consumer preferences for integrating or segregating certain gains or losses. Markowitz's value function makes predictions that are equivalent to the reference dependence value function for large stakes, but are different for small stakes. To illustrate, consider the losses C and D and the gains E and F shown in figure

2. Markowitz' value function predicts that people should prefer to integrate small gains (e.g., one F gain, the equivalent of two E gains, is valued at 4) rather than segregate small gains (e.g., two E gains are valued at 2). Conversely, people should prefer to segregate small losses (e.g., two D losses are valued at -2) rather than integrate small losses (e.g., one C loss, the equivalent of two D losses, is valued at -4).

Markowitz' model is appealing, but it has not been empirically supported in the context of riskless choice. The lack of empirical support for a double-kinked value function may be a consequence of the fact that many resources, such as money, are highly fungible. That is, small monetary gains can easily be saved, aggregated, and allocated to yield maximal marginal utility. For fungible resources, like money, the central value zone (i.e., convex gains, concave losses) may be quite small. As a consequence, people often express a preference to segregate both small and large gains (Morwedge et al. 2007). For non-fungible resources, the central value zone may be considerably larger. The inability to save, aggregate, and allocate nonfungble resources may make people much more sensitive to small amounts, with the definition of small being rather subjective (i.e., dependent on the context).

THE VALUE OF TIME

Time is a finite resource (Jacoby, Szybillo, and Berning 1976; Leclerc et al. 1995; Okada and Hoch 2004). Time cannot be stopped, stockpiled, invested, or expanded. Yet, people tend to think about time as being something that can be gained or lost (just as money) (Rajagopal and Rha 2009). When people complete a work task more quickly than planned, they perceive themselves as having a time savings that can be devoted to leisure activities (Becker 1965; Graham 1981). When people are delayed in completing a task, they perceive themselves as having lost time (Graham 1981). Losing time increases stress (Carmon, Shanthikumar, and Carmon 1995), encourages heuristic processing (Payne, Bettman and Johnson 1988), and leads to more decision errors (Payne, Bettman and Johnson 1993).

Standard economic theory further assumes that people make decisions for time gains and losses in the same way they make decisions for monetary gains and losses (Becker 1965). That is to say, time outcomes are converted to their monetary equivalent (i.e., average wage rate for one hour of work; $12/hour for participants in Okada and Hoch 2004) and these monetary equivalents are studied with standard economic models that are not adjusted for the specifics of the time resource (Borjas 1996). Yet, there is considerable evidence that people treat the time resource very differently than other resources. Okada and Hoch (2004) found that when individuals paid for services in time rather than money, their satisfaction with different levels of service was mitigated when paying with time. Zauberman and Lynch (2005) found that people were more optimistic when predicting future time rather than future money availability. Soman (2001) found that the influence of monetary sunk costs far exceeded that of time sunk costs. Saini and Monga (2008) found that people rely much more on quick and easy heuristics when making decisions on time rather than monetary outcomes.

The different treatment of temporal versus monetary outcomes is primary explained by the lower “fungibility” of time as compared to money (Leclerc et al. 1995; Okada and Hoch 2004; Zauberman and Lynch 2005). Fungibility implies that any unit of a resource is substitutable for another unit and that the source of income is irrelevant for consumption (i.e., money wears no labels) (Abeler and Marklein 2008). This non-fungibility implies that, at best, time savings may be applied immediately, but they often cannot be transferred to new situations. That is, if one’s 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 –combined with 15 minutes time savings due to favorable flight conditions- to arrive 30 minutes earlier at destination. Similarly, time losses may be hard to recoup from other situations.

We propose that the low fungibility of time has implications for the width of the central range of the double-kinked value function proposed by Markowitz. Given that time is closely entangled with activities (i.e. difficult to transfer to new situations), there may meaningful time gains and losses that fall in the central range of the value function. Hence, it seems plausible that people would prefer to have their small time gains integrated rather than segregated, an outcome that would facilitate reallocation of the time (Leclerc et al. 1995). Similarly, it seems plausible that people would prefer to have their small time losses segregated rather than integrated, an outcome that might decrease the possibility that time will have to be allocated away from subsequent activities.

Our hypothesis that time is valued using a double-kinked value function was tested over a series of five experiments. Study 1 shows that people prefer to integrate small time gains and segregate small time losses, thus, providing evidence for the central zone (i.e., convex gains, concave losses) of the double-kinked value function. Study 2 and 3 show the differences between small time and small monetary amounts and, consequently, a preference for integrating / segregating gains / losses. Study 2 shows that people prefer to integrate small time gains but segregate small monetary gains, whereas study 3 shows that people prefer to segregate small time losses, but integrate small monetary losses. Study 4 and 5 show that preference for integrating and segregating small time gains and losses reverse when the time gains and losses become more substantial. Study 4 shows that people prefer to integrate small time gains but segregate large time gains, whereas study 5 shows that people prefer to segregate small time losses, but integrate large time losses.

PILOT STUDY 1

There is considerable evidence that people prefer to segregate gains and integrate losses (Thaler 1999). Thus, a strategy for showing a consumer's unique treatment of a time resource is to show that people prefer to integrate time gains and segregate time losses. A pilot study was designed to assess whether people expressed a preference for integrating time gains and segregating time losses. One hundred twenty participants from an on-line panel were randomly assigned to one of the following two scenarios:

> Time Gain Scenario: We are interested in your general opinion about gaining time. Assume you had the chance to save 30 minutes of time by completing tasks more quickly during your day. Would you prefer to
>
> a. Save 10 minutes on three separate tasks, with the total time savings amounting to 30 minutes.
> b. Save 30 minutes on a single task.
>
> Time Loss Scenario: We are interested in your general opinion about losing time. Assume you knew you were going to lose 30 minutes of time by completing tasks more slowly during your day. Would you prefer to
>
> a. Lose 10 minutes on three separate tasks, with the total time loss amounting to 30 minutes.
> b. Lose 30 minutes on a single task.

In the time gain scenario, participants preferred to have their gains integrated (61%, $n = 64$) instead of segregated (39%, $n = 41$), a choice share that is different than chance ($z = 2.24$).

In the time loss scenario, participants preferred to have their losses segregated (67.7%, $n = 70$) instead of integrated (33.3%, $n = 35$), a choice share that is different than chance ($z = 3.42$). The results conflict with the segregate monetary gains / aggregate monetary losses finding that has emerged from the mental accounting literature (Thaler 1985).

EXPERIMENT 1

Experiment 1 was designed to provide evidence that the preference for integrating time gains and segregating time losses influences choices. This issue was investigated using two replicates. The first replicate involved saving or losing time at an amusement park. The second replicate involved saving or losing time while shopping in a supermarket.

Method

Design and Participants. The experiment manipulated whether participants were experiencing a time gain or time loss. The dependent measure was whether they preferred to experience the gain or loss as integrated or segregated. Participants in the amusement park study were 120 adults that were recruited through Mechanical Turk and paid a fee of $.25 (median age = 28, median education = “some college”) and 154 undergraduate students that participated in return for extra credit. Participants in the supermarket study were 192 undergraduate students that participated in return for extra credit.

Procedure. Participants in the amusement park study were presented with a time gain or a time loss scenario (see appendix A). All participants were told amusement park patrons disliked waiting in lines for rides and that parks were trying to provide information that could help lessen the waits. Some parks were providing electronic Ride Maps that showed the walking distance (in time) and wait times for the five closest rides. The participant was asked to imagine that they were at a Ride Map and the best option (lowest combined travel and wait time) was a ride that was a 10 minute walk followed by a 10 minute wait in line. The participant went to this ride and timed the walk and wait time so it could be compared to the park's estimate. In the 10 minute time gain scenario, the participants was asked if a 10 minute walk and no wait time or a 5 minute walk and 5 minute wait would make them happier. In the 10 minute time loss scenario, the participants was asked if a 10 minute walk and 20 minute wait time or a 15 minute walk and 15 minute wait would make them more irritated.

Participants in the supermarket study were presented with a time gain or a time loss scenario (see appendix A). In the time gain scenario, participants were told that grocery stores could "increase the efficiency of the shopping experience by placing more personnel at the service counters (e.g., bakery, deli, seafood/meat) or at the checkout lanes," but that stores could only make one of these improvements to service. Participants were told to imagine that each change would reduce their average shopping trip from 18 minutes to 14 minutes, but that the time savings would happen in two different ways. If personnel were added to the service counters, the time savings would consist of two 2-minute time savings at two separate service counters. If personnel were added to the check-out counters, the time savings would consist of one 4-minute time savings at check-out.

In the time loss scenario, participants were told that "in these tough economic times, some grocery stores are decreasing the efficiency of the shopping experience by placing fewer personnel at the service counters (e.g., bakery, deli, seafood/meat) or at the checkout lanes.". Participants were told that a local grocer had to make one of these reductions to service quality and that the change would increase their average shopping trip from 14 minutes to 18 minutes. The time loss could happen in two different ways. If personnel were removed from the service counters, the time loss would consist of two additional 2-minute waits at two separate service counters. If personnel were removed from the check-out counters, the time loss would consist of an additional 4-minute wait savings at check-out.

Results

The manipulation of the time gain versus loss frame was significant in the amusement park scenario (χ^2= 28.90). In the gain frame, participants preferred to have their gains integrated (71.6%, *n* = 96) instead of segregated (28.4%, *n* = 38), a choice share that is significantly different than chance (*z* = 5.01). In the loss frame, participants preferred to have their losses segregated (61.4%, *n* = 86) instead of integrated (38.6%, *n* = 54), a choice share that is significantly different than chance (*z* = 2.70).

The manipulation of the time gain versus loss frame was significant in the supermarket scenario (χ^2= 63.46). In the gain frame, participants preferred to have their gains integrated (81.9%, *n* = 77) instead of segregated (18.1%, *n* = 17), a choice share that is significantly different than chance (*z* = 6.19). In the loss frame, participants preferred to have their losses segregated (75.5%, *n* = 74) instead of integrated (24.5%, *n* = 24), a choice share that is significantly different than chance (*z* = 5.05).

EXPERIMENT 2

We hypothesize that time resources are valued differently than other fungible resources (e.g., money), but other fungible resources were not investigated in experiment 1. This raises the possibility that the experiment 1 scenarios, and not time, were responsible for participants' preferences to integrate time gains and segregate time losses. Experiment 2 addresses both of these issues by investigating time and monetary gains using two scenarios. It was expected that participants would prefer to integrate time gains but segregate monetary gains. Experiment 3 will investigate time and monetary losses.

Method

Design and Participants. The experiment manipulated whether participants were experiencing a time gain or monetary gain. The dependent measure was whether participants preferred to experience the gain as integrated or segregated. Ninety-seven undergraduate students participated in the gasoline loyalty program scenario and 154 undergraduate students participated in the cell phone scenario. Participants received extra credit for their participation.

Procedure. In the gasoline loyalty program scenario, participants were told that independent owners of British Petroleum gasoline stations had experienced a 20% drop in revenues after the Gulf of Mexico oil spill (see appendix B). As a consequence, the owners were considering two different strategies for increasing customer loyalty. In the time scenario, the owners were considering two different pump technologies. The first pump technology would allow consumers to save one minute initiating the transaction and one minute filling the tank, a two minute time savings. The second pump technology would allow consumers to save two minutes filling the tank. In the money scenario, repeat customers would be recognized by their debit or credit card and would be given a discount of 10 cents on each of the first ten gallons purchased or $1 on a purchase of 10 or more gallons. Both discounts would require a purchase of 10 or more gallons.

In the cell phone scenario, participants read about how U.S. cell phone service providers were changing pricing policies from unlimited downloads to a base fee plus a variable cost per GB downloaded (see appendix B). Participants were told that providers were considering different strategies for encouraging consumers to increase the volume of downloaded material. In the time scenario, service providers were considering offering a premium service that could halve the time it took to download material. In the money scenario, service providers were considering offering the downloaded material at one-half the normal price. To promote the service, consumers would receive a three-day free trail. Participants had to indicate if they would want the trial for three consecutive days (integrated) or for three individual days (segregated) in a ten day period.

Results

The manipulation of the time gain versus money gain frame was significant in the gasoline station scenario (χ^2= 24.96) and the cell phone service scenario (χ^2= 12.55). In the gasoline station scenario, participants preferred to have their time gains integrated (79.2%, n = 38) instead of segregated (20.8%, n = 10), a choice share that is different than chance (z = 4.04), and their monetary gains segregated (71.4%, n = 35) instead of integrated (28.6%, n = 14), a choice share that is different than chance (z = 3.00). In the phone service scenario, participants preferred to have their time gains integrated (63.2%, n = 48) instead of segregated (36.8%, n = 28), a choice share that is different than chance (z =2.29), and their monetary gains segregated (65.4%, n = 51) instead of integrated (34.6%, n = 27), a choice share that is different than chance (z = 2.72).

EXPERIMENT 3

Experiment 2 investigated time gains and monetary gains, showing that people preferred integrate time gains but segregate monetary gains. Experiment 3 investigates time losses and monetary losses in order to show that people prefer to segregate time losses but integrate monetary losses. Experiment 3 addressed time and monetary losses using two scenarios – driving in rush hour traffic (traffic) and registering an automobile (vehicle registration).

Method

Design and Participants. The experiment manipulated whether participants were experiencing a time or monetary loss. The dependent measure was whether participants preferred to experience the loss as integrated or segregated. Participants were recruited from an online panel and were randomly assigned to condition in the traffic (n = 169) and the vehicle registration (n = 193) scenario. Across the two scenarios, the 362 participants had a median age of 31 and a median education of some college. Participants were paid a nominal fee for their participation.

Procedure. In the traffic scenario with time as a resource, participants were told that the normal commute from their office to their home was 20 minutes, but that the commute time increased to 40 minutes during rush hour (see appendix C). Participants were then asked to indicate which of two routes they would prefer to use in rush hour. Route (a) concentrated all of the delays in the first part of the trip (more integrated loss), whereas route (b) spread delays over the entire length of the trip (more segregated loss). In the traffic scenario with money as a resource, participants were told that rush hour traffic was controlled through a toll system so that the commute time was identical to the non-rush hour commute time. The cost for the controlling traffic in rush hour was a toll system. Participants were then asked to indicate which of two routes they would prefer to use in rush hour. Route (a) concentrated all of the payments for tolls into a single payment of $3 (integrated loss), whereas route (b) collected three separate toll payments of $1 (segregated loss). Toll payments were collected electronically, so each route was equally equivalent in all other respects.

In the vehicle registration scenario with time as a resource, participants were told that they had forgotten to renew their vehicle registration and that they would have to do so in person. They were given two options for renewal that varied by time of day, and consequently the drive time to the registration renewal location and the wait time once at the location. Option (a) stated that the drive to the registration renewal location was 15 minutes, but that there would be a 15 minute wait in the service line (integrated loss). Option (b) stated that the drive to the registration renewal location was 30 minutes, but that there would be no wait in the service line (segregated loss). Option (b) distributed the time loss across the entire drive time, hence the delay was segregated. In the registration scenario with money as a resource, participants were told that they had forgotten to renew their vehicle registration and that they would have to do so in person. They were told that the price of renewal had increased by $37 as a consequence of their tardiness. They were then asked if they would prefer to have this additional fee described as a single $37 fee (integrated loss) or as a separate late fee ($20) and service fee ($17) (segregated loss).

Results

The manipulation of the time loss versus money loss was significant in the traffic scenario (χ^2= 31.53) and the vehicle registration scenario (χ^2= 14.59). In the traffic scenario, participants preferred to have their time losses segregated (71.4%, n = 60) instead of integrated (28.6%, n = 24), a choice share that is different than chance (z = 3.93), and their monetary losses integrated (71.8%, n = 61) instead of segregated (28.2%, n = 24), a choice share that is different than chance (z = 4.01). In the vehicle registration scenario, participants preferred to have their time losses segregated (61.9%, n = 60) instead of integrated (38.1%, n = 37), a choice share that is different than chance ($z = 2.34$), and their monetary losses integrated (65.6%, $n = 63$) instead of segregated (34.4%, $n = 33$), a choice share that is different than chance ($z = 3.06$).

Discussion

We have argued that people prefer to integrate time gains, and segregate time losses, because they are less sensitive to small changes in time. This lack of sensitivity to changes in time expands the inflection points of the double-kinked value curve outward. As a consequence, the time gains and losses that were investigated in experiments 1 through 3 were perceived as relatively "small." In the remaining two experiments, we show that altering the perceived magnitude of a time gain or loss can influence the preference for integrated / segregated time gains / losses. We show how changing the magnitude of a time gain or loss, relative to a fixed allotment of time, can lead to preferences for time gain (loss) integration versus segregation.

EXPERIMENT 4

Experiment 4 investigated small versus large time gains. We predicted that people would prefer to integrate small time gains, but segregate large time gains. Experiment 4 investigated time gains using two scenarios – vacation travel and preparing a holiday meal.

Method

Design and Participants. The experiment manipulated whether participants were experiencing a small or large time gain. The dependent measure was whether participants preferred to experience the gain as integrated or segregated. Participants were recruited from an online panel and were randomly assigned to conditions in the vacation travel ($n = 175$) and holiday meal preparation ($n = 173$) scenarios. Across the two scenarios, the participants had a median age of 27 and a median education of some college. Participants were paid a nominal fee for their participation.

Procedure. In the vacation scenario, participants were told they were taking a 10 day vacation that required extensive travel. In the small time gain condition, they were asked if they preferred to save one hour of travel time in both directions, two hours of travel time on the way there, or two hours of travel time on the way back (see appendix D). In the large time gain scenario, these times were increased to six hour in each direction or 12 hours in one direction.

In the holiday meal preparation scenario, participants were told that a typical consumer spends considerable time preparing a holiday meal. Further, celebrity chefs provide consumers with time saving recipes. These recipes allowed consumers to save time preparing the ingredients or cooking the food. In the small time gain scenario, participants were asked if they wanted to save five minutes on preparing the ingredients and five minutes on cooking the food, save 10 minutes on preparing the ingredients, or save 10 minutes on cooking the food (see appendix D). In the large time gain scenario, these times were increased to 60 minutes of time savings for preparing and cooking and 120 minutes of savings when cooking or preparing.

Results

The manipulation of the small versus large time gain was significant in the vacation scenario ($\chi^2 = 13.97$) and the holiday meal scenario ($\chi^2 = 12.01$). In the vacation scenario, participants preferred to have their small time gains integrated (59.6%, $n = 53$) instead of segregated (40.4%, $n = 36$), a choice share that is different than chance ($z = 1.81$), and their large gains segregated (68.6%, $n = 59$) instead of integrated (31.4%, $n = 27$), a choice share that is different than chance ($z = 3.45$). In the holiday meal scenario, participants preferred to have their small time gains integrated (66.3%, $n = 59$) instead of segregated (33.7%, $n = 30$), a choice share that is different than chance ($z = 3.07$), and their large gains segregated (59.8%, $n = 52$) instead of integrated (40.2%, $n = 35$), a choice share that is different than chance ($z = 1.82$).

EXPERIMENT 5

Experiment 5 investigated small versus large time losses. We predicted that people would prefer to segregate small time losses, but integrate large time losses. Experiment 5 investigated losses using two scenarios – public transportation and vacation travel time.

Method

Design and Participants. The experiment manipulated whether participants were experiencing a small or large time loss. The dependent measure was whether participants preferred to experience the loss as integrated or segregated. Participants were recruited from an online panel and were randomly assigned to conditions in the public transportation ($n = 232$) and the holiday present ($n = 373$) scenarios (data collected separately for each scenario). Across the two scenarios, the participants had a median age of 26 (public transportation) or 24 (holiday present) and a median education of some college (both scenarios). Participants were novices with respect to the activities described in the scenario (i.e., public transportation participants were not daily commuters, holiday present participants did not have primary responsibility for child care). Participants were paid a nominal fee for their participation.

Procedure. In the public transportation scenario, participants were told that 35 million people regularly use public transportation in the United States and that the number one source of dissatisfaction is delays in service (see Appendix E). Participants were asked to assume that their normal commute time was 60 minutes, consisting of two 20 minute bus rides and two 10 minute wait times. Participants were then asked to indicate which of two delays they would prefer. The short delay, integrated loss option increased the travel time of one bus ride from 20 to 30 minutes. The short delay, segregated loss option increased the travel time of each bus ride from 20 to 25 minutes. It was clear that the total travel time was increased from 60 to 70 minutes in each condition. The long delay, integrated loss option increased the travel time of one bus ride increased from 20 to 60 minutes. The long delay, segregated loss option increased the travel time of each bus ride from 20 to 40 minutes. It was clear that the total travel time was increased from 60 to 100 minutes in each condition.

In the holiday present scenario, participants were told that many families exchange gifts during the Holiday Season (see Appendix E). Some families had experienced "present overdose," a consequence of opening too many presents in a short amount of time. As a consequence, these families were experimenting with having children take breaks between opening presents. Participants were asked which gift-opening-schedule would be best for children celebrating Christmas? The short delay, integrated loss option scheduled a 60 minute delay in between present opening sessions ("Open 1 /2 of gifts, wait 60 minutes, open second 1/2 of gifts."). The short delay, segregated loss option scheduled two 30 minute delay in between present opening sessions ("Open 1 /3 of gifts, wait 30 minutes, open second 1/3 of gifts, wait 30 minutes, open last 1/3 of gifts."). In the long delay condition, the integrated loss delay was increased to an entire day and the segregated loss was increased to two half days.

Results

The manipulation of the focus of the time loss was significant in the public transportation scenario ($\chi^2 = 9.22$) and the holiday present scenario ($\chi^2 = 7.53$). In the public transportation scenario, participants preferred to have their short time delays segregated (58.9%, $n = 73$) instead of integrated (41.1%, $n = 51$), a choice share that is different than chance ($z = 1.98$). They also preferred to have their long time delays integrated (61.1%, $n = 66$) instead of segregated (38.9%, $n = 42$), a choice share that is different than chance ($z = 2.31$). In the holiday present scenario, participants preferred to have their short time delays segregated (56.9%, $n = 107$) instead of integrated (43.1%, $n = 81$), a choice share that is different than chance ($z = 1.90$). They also preferred to have their long time delays integrated (57.3%, $n = 106$) instead of segregated (42.7%, $n = 79$), a choice share that is different than chance ($z = 1.99$).

GENERAL DISCUSSION

Do people value temporal and monetary outcomes similarly? The current studies show that in situations where the stakes are considerably large, respondents' decisions regarding time were similar to those typically found for money (Study 4 and Study 5). That is to say, people preferred to experience multiple gains in a segregated manner but to undergo multiple losses at once. In the context of small stakes, however, the evaluation of time outcomes differed from the evaluation of monetary outcomes (Study 2 and Study 3). People preferred to have multiple small time gains integrated and multiple small time losses segregated (Study 1). Moreover, we have showed that the preference for integration of small time gains and for a segregation of small time losses is robust across different decision contexts (e.g., amusement park, supermarket, transportation).

While we believe that decisions for all resources are made according to a value function with a double inflection point (i.e., small and large outcomes are evaluated dissimilarly), these findings suggest that the inflection points shift outwards for choices regarding time. As such, stimulus values are more likely to fall in the concave loss/convex gains region when they are expressed in temporal rather than, for example, monetary units. We believe that the inflection points of the value function for times are shifted outwards as a consequence of the non-fungibility of this resource. Several small time gains are meaningless because one cannot recombine them afterwards in one larger time gain chunk (i.e., time is difficult to transfer to new situations). Likewise, several small time losses are less harmful than one larger time loss because multiple small time losses are easier to recoup (e.g., by increasing efficiency). This reasoning would entail that other, non-fungible resources are also valued according to a value function with a more expansive reverse S-shaped region (i.e., concave losses/convex gains).

Thaler (1985) explained prospect theory's value function in the light of psychological perception: "the value function … captures the basic psychophysics of quantity. The difference between $10 and $20 seems greater than the difference between $110 and $120, irrespective of the signs of the amounts in question." Indeed, psychophysics has shown that sensation and perception are subject to contraction. Weber's Law states that the threshold of discriminating two stimuli, such as brightness or loudness, increases monotonically as the intensity of stimuli increases. Moreover, the Weber-Fechner law depicts the relationship between physical stimulus and the corresponding human sensation as a logarithmic function (i.e., decreasing sensitivity). Interestingly, psychophysics has also shown that the subjective *experience* of duration grows as a logarithmic function of real duration. Our findings, predicting increasing sensitivity in the *evaluation* of a wide range of time gains and losses, seem to suggest that the value function may be capturing something else than "the basic psychophysics of quantity". Moreover, they are more in line with Stevens Power Law, which suggest that the relationship between stimulus intensity and the subjective sensation is best depicted by a power function (which can be convex if the power coefficient > 1) from which the curvature depends on the stimulus under consideration.

Valuing Resources

The results suggest there are opportunities to investigate the valuation of a wide range of resources. To date, the economic approach to resource valuation has put an inordinate amount of emphasis on the study of monetary resources. Our contention is that the valuation of monetary resources is fairly well understood. What is less understood is the valuation of other resources, including natural resources (e.g., food, fossil fuel, natural resources, habitat, biodiversity), social capital (social network, interpersonal ties, family support), psychological resources (e.g., emotional, patience, resilience, willpower), and physiological resources (e.g., metabolic energy, mental energy, pain tolerance). Some of these resources are more non-fungible than fungible. This implies that, in the domain of small stakes, segregated gains will be less appreciated than integrated gains and segregated losses will be more acceptable than integrated losses.

There are a number of findings that are consistent with the idea that integrated non-fungible gains will be more appreciated than segregated non-fungible gains though, in all cases, the research is not focused on resource valuation. For example, satiation occurs when the rate of rewards is too concentrated. People express a preference for, and consume, integrated rewards, even though this pattern of consumption does not maximize cumulative levels of affective experience (Nelson, Meyvis, and Galak 2009). In a different domain, job satisfaction increases when social ties are among one large group as compared to multiple smaller groups (Totterdell et al. 2004), suggested that people prefer more concentrated experiences of social rewards. In domains such as knowledge creation, the whole is also more than the sum of its parts, which would entail a preference for integrated gains (Hudson and Ozanne 1988). In these domains, it is the relationships between several units of information that create value.

There are also a number of findings that are consistent with the idea that segregated non-fungible losses will be more tolerable than integrated non-fungible losses. First, environmental researchers generally agree that natural resources are undervalued because they are lost at a slow rate (Carpenter, Bennett, and Peterson 2006). Second, Ariely (1998) finds that lower intensity, segregated pain experiences lead to a more manageable pain experience than higher intensity, integrated pain experiences. Third, Sanders (1982-3) finds that bereaved loved ones recover better from long-term chronic illness death than sudden death.

The Influence of Beliefs

A potential research opportunity, and one of the major difficulties of doing research on the value of resources, is an understanding of the influence of beliefs on valuation. That is, we encountered scenarios in which experience-based preferences might have overshadowed the influence of the value function. We can illustrate the influence of experience-based preferences with a few examples of monetary and time preferences. Our first set of examples refers to monetary gains and losses. A survey of 125 participants from an on-line sample said they preferred to "Save $30 on a single purchase" (59%, n = 74) rather than "Save $10 on three separate purchases, with the total savings amounting to $30" (41%, n = 51) (z = 2.09). The same group said they preferred to "Overspend by $10 on three separate purchases, with the total loss amounting to $30" (65%, n = 81) rather than "Overspend $30 on a single purchase" (35%, n = 44) (z = 3.46). These findings are in direct opposition to the segregate gains and integrate losses recommendations of prospect theory.

Our second set of examples refers to time gains and losses. First, we asked an internet sample of people about security screening at the airport. We found that people preferred to segregate gains ("Save five minutes in the identification verification line and five minutes at the dangerous materials checkpoint" [71%, n = 22] versus "Save ten minutes in the identification verification line"[29%, n = 9; z = 2.57) and losses ("Lose five minutes in the identification verification line and five minutes at the dangerous materials checkpoint" [87%, *n* = 26] versus "Lose ten minutes in the identification verification line"[13%, *n* = 4; *z* = 5.91] (between-subject). Next, we asked a different sample of people about their leisure time. We found that people preferred to integrate gains ("Gain 30 minutes of leisure time on a single day" [79%, *n* = 23) versus "Gain 15 minutes of leisure time on each of two separate days (gain 30 minutes total total)" [21%, *n* = 6; *z* = 4.03]) and losses ("Lose 30 minutes of leisure time on a single day" [75%, *n* = 23) versus "Lose 15 minutes of leisure time on each of two separate days (lose 30 minutes total total)" [25%, *n* = 7; *z* = 3.45]).

These examples illustrate the influence of experience on preferences. Our first example shows that people want to integrate monetary gains and segregate monetary losses in a shopping environment. Most people have experienced a shopping environment often, hence, experiences in this environment can alter preferences so that they are inconsistent with the predictions of mental accounting theory. Our other two examples show that people want to segregate gains and losses in an airport security line, but integrate gains and losses of leisure time. Again, security lines and managing leisure time are common experiences. Familiarity with these experiences overrides the influence of the value function. Together, these examples illustrate the importance of prior experience in masking the fundamental influence of a value function on preference. While it may be the case that there is a basal impact of the value function on preference (e.g., Chen, Lakshminarayanan, Santos 2006; Harbaugh, Krause, and Vesterlund 2001), referent dependent value should have a smaller influence on preferences as choice situations become more familiar and practiced.

Valuing Non-personal Time

We hypothesize that the influence of prior experiences on time valuation is particularly important with respect to exploring preferences for time-based decisions that do not involve personal time. For example, delivery time is a critical component of many sales transactions. Yet, delivery time is not personal time – it is an (in)convenience time. Thus, although a value function may contribute to decisions involving delivery time, it is just as likely that preferences have developed as a consequence of prior experiences with delivery schedules. We anticipate that similar claims could be made about the length of a service (e.g., massage), the timing of a service (e.g., table times a busy restaurant), the effectiveness of a product (e.g., boot time on a computer), or the length of a product experience (e.g., flavor in a piece of gum). In each of these cases, time is a product attribute as opposed to a resource. The valuation of product attributes is unlikely to rely on the same processes as lost or gained personal time.

Conclusion

The shape of one's utility function is dependent on the stake size and the fungibility of the resource. We find that resource valuation conforms to a double-kinked value function: small gains and losses are valued in line with increasing marginal utility, while large gains and losses are valued in line with decreasing marginal utility. We document the double-kinked value function using time, a fungible resource in which small gains and losses have a different psychological meaning than large gains and losses. These results are in contrast to historical evidence of a single-kinked value function for monetary resources, suggesting that the properties of a resource determine the way in which it will be valued. As a consequence, there is an opportunity to investigate the influence of resource properties on resource valuation.

Appendix A

Amusement Park

<u>Time Gain</u>: A trip to an amusement park is generally a fun experience, but there are drawbacks. One part of the amusement park experience that patrons dislike is waiting in lines for rides. An innovative solution to this problem is to provide patrons with information about ride waits so that they can anticipate how long they will have to wait.

Some amusement parks are taking this concept to the next level. At the entrance to the line for each ride, the park has an electronic Ride Map that shows the wait time for the ride as well as the walking distance (in time) and wait time for the five closest rides. The amusement park also places these Ride Maps in other locations throughout the park. In this way, patrons can better plan the use of their time.

Suppose you are at the entrance to an amusement park and you encounter a Ride Map. The best option (lowest combined travel and wait time) is a ride that is a 10 minute walk followed by a 10 minute wait in line. You decide to time the walk and the time in line so that you can see if your experience is consistent with the park's estimates. Which experience would make you happier?

a. The walk to the ride is 10 minutes and there is no line at the ride. (71.6%, *n* = 96)
b. The walk to the ride is 5 minutes and there is a 5 minute wait in the line at the ride. (28.4%, *n* = 38)

<u>Time Loss</u>: A trip to an amusement park is generally a fun experience, but there are drawbacks. One part of the amusement park experience that patrons dislike is waiting in lines for rides. An innovative solution to this problem is to provide patrons with information about ride waits so that they can anticipate how long they will have to wait.

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a. The walk to the ride is 10 minutes and there is a 20 minute wait in the line at the ride. (38.6%, *n* = 54)
b. The walk to the ride is 15 minutes and there is a 15 minute wait in the line at the ride. (61.4%, *n* = 86)

Grocery Store

Time Gain: Grocery stores understand that consumers want to shop efficiently. Grocery stores can increase the efficiency of the shopping experience by placing more personnel at the service counters (e.g., bakery, deli, seafood / meat) or at the checkout lanes. Few grocery chains can afford to heavily staff the service counters and the checkout lanes because labor costs are the most expensive variable cost in a grocery store.

A local grocer is interested in how to allocate their labor – to the service counters or to the checkout lanes. The grocer has determined that adding three additional personnel to the service counters (one for bakery, one for deli, and one for seafood) or to the checkout lanes will reduce the time of an average major shopping trip (i.e., more than 10 items purchased) from 18 minutes to 14 minutes, assuming a consumer uses a minimum of two service counters.

Assuming you typically visit two service counters on a major shopping trip, what would you prefer

a. To save two minutes at each of two service counters (four minutes of time savings). (18.1%, $n = 17$)
b. To save four minutes at checkout (four minutes of time savings). (81.9%, $n = 77$)

Time Loss: Grocery stores understand that consumers want to shop efficiently. Yet, in these tough economic times, some grocery stores are decreasing the efficiency of the shopping experience by placing fewer personnel at the service counters (e.g., bakery, deli, seafood/meat) or at the checkout lanes. Few grocery chains can afford to heavily staff the service counters and the checkout lanes because labor costs are the most expensive variable cost in a grocery store.

A local grocer is interested in how to allocate their labor – to the service counters or to the checkout lanes. The grocer has determined that removing three personnel from the service counters (one for bakery, one for deli, and one for seafood) or from the checkout lanes will increase the time of an average major shopping trip (i.e., more than 10 items purchased) from 14 minutes to 18 minutes, assuming a consumer uses a minimum of two service counters.

Assuming you typically visit two service counters on a major shopping trip, what would you prefer

a. To lose two minutes at each of two service counters (four minutes of time lost). (75.5%, $n = 74$)
b. To lose four minutes at checkout (four minutes of time lost). (24.5%, $n = 24$)

Appendix B

Buying Gas

All Participants: It is very difficult for gas stations to build customer loyalty. In 2009, 93% of consumers said they bought gas at the cheapest station in their area, with no allegiance to a particular station or brand. This all changed after the British Petroleum oil spill in the Gulf of Mexico. Although consumers still claim no allegiance to a particular station or brand, an Economist/YouGov survey finds that 28% of consumers say that they try to avoid British Petroleum stations if possible.

British Petroleum (BP) stations are independently owned and operated (not owned by the British Petroleum Corporation). The BP station owners report that revenues have dropped over 20% since the spill. To address this issue, the gas station owners have devised a plan to encourage consumers to be loyal to BP.

Time Gain: The plan revolves around the upgrading of the gas pumps. There are two new types of gas pumps that the station owners can purchase. The first gas pumps have a finger print pad that can recognize past customers. This allows the gas pump to skip zip code verification, speeds transaction authorization, and reduces prompts concerning receipts. In effect, the consumer starts pumping gas one minute faster. The machine also includes a pump accelerator that pumps each gallon of gas six seconds faster. Thus, the average 10 gallon fill will save two minutes (one minute initiating the transaction and one minute on the actual filling).

The second type of gas pump incorporates a high speed pump, but no finger print pad. The high speed pump delivers each gallon of gas 12 seconds faster. Thus, the average 10 gallon fill will save two minutes on the actual filling.

The independent owners know that the time savings is equivalent, but are concerned that consumers might find one or the other form of time savings more appealing. If you were to participate in this plan, how would you prefer to save time? (Circle one)

a. Save 1 minute getting the pump ready and 1 minute filling my tank (2 total minutes of savings). (20.8%, $n = 10$)
b. Save 2 minutes filling my tank (2 total minutes of savings). (79.8%, $n = 38$)

Monetary Gain: The plan revolves around the use of a loyalty program. Once a consumer enrolls (a one minute process), they will be "recognized" when they use a credit or debit card at the pump and will be given a discount. The discount can be offered in one of two ways.

a. Save 10 cents per gallon on the first ten gallons purchased (i.e., save \$1). (71.4%, $n = 35$)
b. Save \$1 gallon on the entire purchase of 10 or more gallons of gas (i.e., save \$1). (28.6%, $n = 14$)

All Participants: This discount will be given every time the consumer buys 10 or more gallons of gas at a participating BP station.

The independent owners know that the discount amount is equivalent, but are concerned that consumers might find one or the other form of savings more appealing. If you were to participate in this plan, how would you prefer to save money? (Check one)

___ option a ____option b

Cell Phone

All Participants: Cell phone consumers continue to use more bandwidth than cell phone providers can provide. As a consequence, most major providers (AT&T, Verizon, Sprint) are shifting from unlimited data downloads to a set amount of downloads per month. For example, AT&T sells a plan with the iPhone that provides 2GB of downloads for $20 per month (2GB of downloads is the equivalent of 200 minutes of streaming video). Consumers pay extra for monthly downloads in excess of 2GB. This allows AT&T to generate the revenue needed to build bigger networks.

Cell phone providers estimate that 11.4 % of consumers currently exceed their monthly data download allocation. These consumers pay additional fees for the extra data. The problem is that many consumers download much less data after reaching their limit (i.e., if a consumer uses 2GB in the first 10 days of the month, the consumer will only use 1GB in the remaining 20 days of the month). Cell phone providers would like to encourage more than 11.4% of users to exceed their monthly limit as well as encourage additional usage after the limit has been exceeded. Again, extra downloads result in more revenue.

Time Gain: One way for cell phone providers to encourage more downloads is to reduce the amount of time it takes to download additional data. For example, a carrier could make downloads twice as fast after the 2GB limit has been reached. Although the cost per GB would remain the same, a 24 minute television program that used to take 8 minutes to download would now load in 4 minutes. In effect, the cell phone provider would reward the heavy cell user by saving the user time on additional downloads.

a. To have three consecutive days of enhanced service (63.2%, n = 48).
b. To have three individual days of enhanced service during a ten day period (36.8%, n = 28)

Monetary Gain: One way for cell phone providers to encourage more downloads is to reduce the amount of money it costs download additional data. For example, a carrier could make downloads cost half as much after the 2GB limit has been reached. Although the time to download would remain the same, a video that used to cost $2.40 to download would now cost $1.20 to download. In effect, the cell phone provider would reward the heavy cell user by saving the user money on additional downloads.

a. To have three consecutive days of enhanced service (34.6%, n = 27).

b. To have three individual days of enhanced service during a ten day period (65.4%, n = 51).

All Participants: The best way to promote this service is to let the consumer “sample” the better service. There are two ways to do this. First, the cell phone provider can give the consumer a three-consecutive-day trial of the enhanced service. Second, the cell phone provider can give the consumer three individual days of enhanced service in a ten day period. In each case, the trial period will be assigned by the cell phone provider so they can ensure that too many users do not try the enhanced service at the same time.

Our question is about your preference. If you could reduce the time of every download you make by half, would you prefer: (circle one)

Appendix C

Rush Hour

Time Loss: In many cities, traffic slows considerably during rush hour. Please imagine that a non-rush hour drive from your office to your house is 20 minutes. In rush hour, travel time doubles to 40 minutes.

Now suppose you have two possible routes you can travel in rush hour. Route A starts with 20 minutes of stop and go traffic (i.e., you travel less than a mile in 20 minutes), followed by 20 minutes of driving at the regular speed limit. Route B is 40 minutes of driving at one half the regular speed limit. Each route waste 20 minutes of your time, but in a different way. Which would you prefer?

a. Route A: 20 minutes of stop and go traffic (i.e., you travel less than a mile in 20 minutes), followed by 20 minutes of driving at the regular speed limit. (28.6%, $n = 24$)
b. Route B: 40 minutes of driving at one half the regular speed limit. (71.4%, $n = 60$)

Monetary Loss: In many cities, traffic slows considerably during rush hour. Please imagine that a non-rush hour drive from your office to your house is 20 minutes. In rush hour, travel time usually doubles to 40 minutes.

In order to discourage commuters from driving in rush, your city has started charging “road usage fees” during rush hour. There is no way to avoid these fees. Rush hour drivers are required to have a prepaid E-Z Pass transponder (a type of toll card that mounts on your dashboard or windshield) and fees are electronically deducted as they drive through certain areas of the city.

Drivers do not have to stop to pay the fee, but they do hear a “ding” every time money is deducted. The consequence of this policy is that fewer people drive during rush hour, so that your rush hour commute to your house now takes 20 minutes.

Suppose you decide to drive home during rush hour and there are two possible routes you can travel. Route A charges $1 on three separate occasions during the commute (you will hear three spate dings). Route B charges $3 on one occasion during the commute (you will hear a single ding). Again, the money is electronically deducted from your prepaid E-Z Pass, so your preference should depend on your desire to pay once or multiple times. Which would you prefer?

a. Route A: Have $3 deducted from my E-Z Pass on one occasion ($3 total). (71.8%, $n = 61$)
b. Route B: Have $1 deducted from my E-Z Pass on three separate occasions ($3 total). (28.2%, $n = 24$)

Renewing Automobile Registration

Time Loss: Every year, a car owner has to renew his/her automobile registration. Failure to do so can result in significant fines for a person caught driving the unregistered vehicle.

Most car owners renew their registration via mail or online. In the event a car owner forgets to renew the registration, and the date for renewal passes, most states require the renewal process to be competed in person. Please imagine that you live in one of these states, that you have forgotten to renew your registration, and that you must now renew your registration in person.

You know that the renewal process is going to take time and you are irritated that you will have to waste this time. You have the option of going to the renewal center when traffic is heavy but the lines are short or when the traffic is light but the lines are long. Which of these options would you prefer?

a. Spend 30 minutes getting there, but have no wait to see a clerk. (61.9%, n = 60)
b. Spend 15 minutes getting there and have a 15 wait to see a clerk. (38.1%, n = 37)

Monetary Loss: Every year, a car owner has to renew his/her automobile registration. Failure to do so can result in significant fines for a person caught driving the unregistered vehicle.

Most car owners renew their registration via mail or online. In the event a car owner forgets to renew the registration, and the date for renewal passes, most states require the renewal process to be competed in person. Please imagine that you live in one of these states, that you have forgotten to renew your registration, and that you must now renew your registration in person.

When you get to the renewal center, you find that the cost of renewing your registration is $37 more than you would pay to register via mail or online. You ask the clerk what the extra $37 fee is for. What answer would prefer to hear (i.e., what answer would make you less irritated).

a. There is a $20 late fee and a $17 service fee. (34.4%, n = 33)
b. There is a $37 late fee. (65.6%, n = 63)

Appendix D

Vacation

<u>Small Time Gain</u>: Assume you are taking a 10 day vacation that requires EXTENSIVE travel time (e.g., a LONG day) to and from the destination. Would you prefer to:

a. Save 1 hour of travel time in each direction, with the total time savings amounting to 2 hours. (40.4%, n = 36)
b. Save 2 hours of travel time on the way there. (27%, n = 24)
c. Save 2 hours of travel time on the way back. (32.6%, n = 29)

<u>Big Time Gain</u>: Assume you are taking a 10 day vacation that requires EXTENSIVE travel time (e.g., an LONG day) to and from the destination. Would you prefer to:

a. Save 6 hours of travel time in each direction, with the total time savings amounting to 12 hours. (68.6%, n = 59)
b. Save 12 hours of travel time on the way there. (17.4%, n = 15)
c. Save 12 hours of travel time on the way back. (14%, n = 12)

Cooking a Meal

<u>Small Time Gain</u>: A typical consumer spends considerable time preparing a Holiday meal. Celebrity chefs provide consumers with time saving recipes. Recipes for the exact same dish can be created so that time is saved on preparing the ingredients or cooking the food (time that must be spent at the stove). Which type of time savings would be most attractive to you?

a. Save 5 minutes on preparing the ingredients and 5 minutes on cooking the food (time that must be spent at the stove). (33.7%, n = 30)
b. Save 10 minutes on preparing the ingredients. (50.6%, n = 45)
c. Save 10 minutes on cooking the food (time that must be spent at the stove). (15.7%, n = 14)

<u>Big Time Gain</u>: A typical consumer spends considerable time preparing a Holiday meal. Celebrity chefs provide consumers with time saving recipes. Recipes for the exact same dish can be created so that time is saved on preparing the ingredients or cooking the food (time that must be spent at the stove). Which type of time savings would be most attractive to you?

a. Save 60 minutes on preparing the ingredients and 60 minutes on cooking the food (time that must be spent at the stove). (59.8%, n = 52)
b. Save 120 minutes on preparing the ingredients. (21.8%, n = 19)
c. Save 120 minutes on cooking the food (time that must be spent at the stove). (18.4%, n = 16)

Appendix E

Public Transportation

35 million people regularly use public transportation in the United States. The number one source of dissatisfaction with public transportation is delays in service. Trains, buses, and subways often do not arrive when they should. As a consequence, commute time increases and commuters are irritated.

We would like to understand what types of public transportation delays people find most irritating. Suppose your typical commute consists of two bus trips, separated by a transfer between buses. As shown below, you typically wait 10 minutes for the first bus to arrive, travel 20 minutes, wait 10 minutes for the second bus to arrive, and travel 20 more minutes. Your total commute time is 60 minutes.

	Typical Wait	Travel Time
Bus A	10 minutes	20 minutes
Bus B	10 minutes	20 minutes

Although no one likes delays, they do happen. If your commute was to experience delays, which of the following two delays would you prefer?

Small Time Loss

a. The travel time on the first bus is 30 minutes instead of 20. Everything else remains the same and your commute time increases from 60 minutes to 70 minutes. (41.1%, $n = 51$)

b. The travel time on first bus is 25 minutes instead of 20 and the travel time on the second bus is 25 minutes instead of 20. Everything else remains the same and your commute time increases from 60 minutes to 70 minutes. (58.9%, $n = 73$)

Big Time Loss

a. The travel time on the first bus is 60 minutes instead of 20. Everything else remains the same and your commute time increases from 60 minutes to 100 minutes. (61.1%, $n = 66$)

b. The travel time on first bus is 40 minutes instead of 20 and the travel time on the second bus is 40 minutes instead of 20. Everything else remains the same and your commute time increases from 60 minutes to 100 minutes. (38.9%, $n = 42$)

Holiday Presents

Many families exchange gifts during the Holiday Season. For children, this is an exciting time – sometimes too exciting. Many parents have noticed that their children experience “present overdose," a consequence of opening too many presents in a short amount of time. This is especially a problem for families that celebrate Christmas.

Some families have started experimenting with having children take breaks between opening presents. These breaks can cause a little frustration in the children, but they tend to create a better over experience. Which of the following schedule for opening gifts do you think would be best for children celebrating Christmas?

Small Time Loss

a. Open 1 /2 of gifts, wait 60 minutes, open second 1/2 of gifts. (43.1%, $n = 81$)
b. Open 1 /3 of gifts, wait 30 minutes, open second 1/3 of gifts, wait 30 minutes, open last 1/3 of gifts. (56.9%, $n = 107$)

Big Time Loss

a. Open 1 /2 of gifts Christmas Eve and 1/2 gifts the evening of Christmas Day. (57.3%, $n = 106$)
b. Open 1 /3 of gifts Christmas Eve, open second 1/3 of gifts Christmas morning, open last 1/3 of gifts the evening of Christmas Day. (42.7%, $n = 79$)

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FIGURE 1: THE REFERENCE DEPENDENCE VALUE FUNCTION

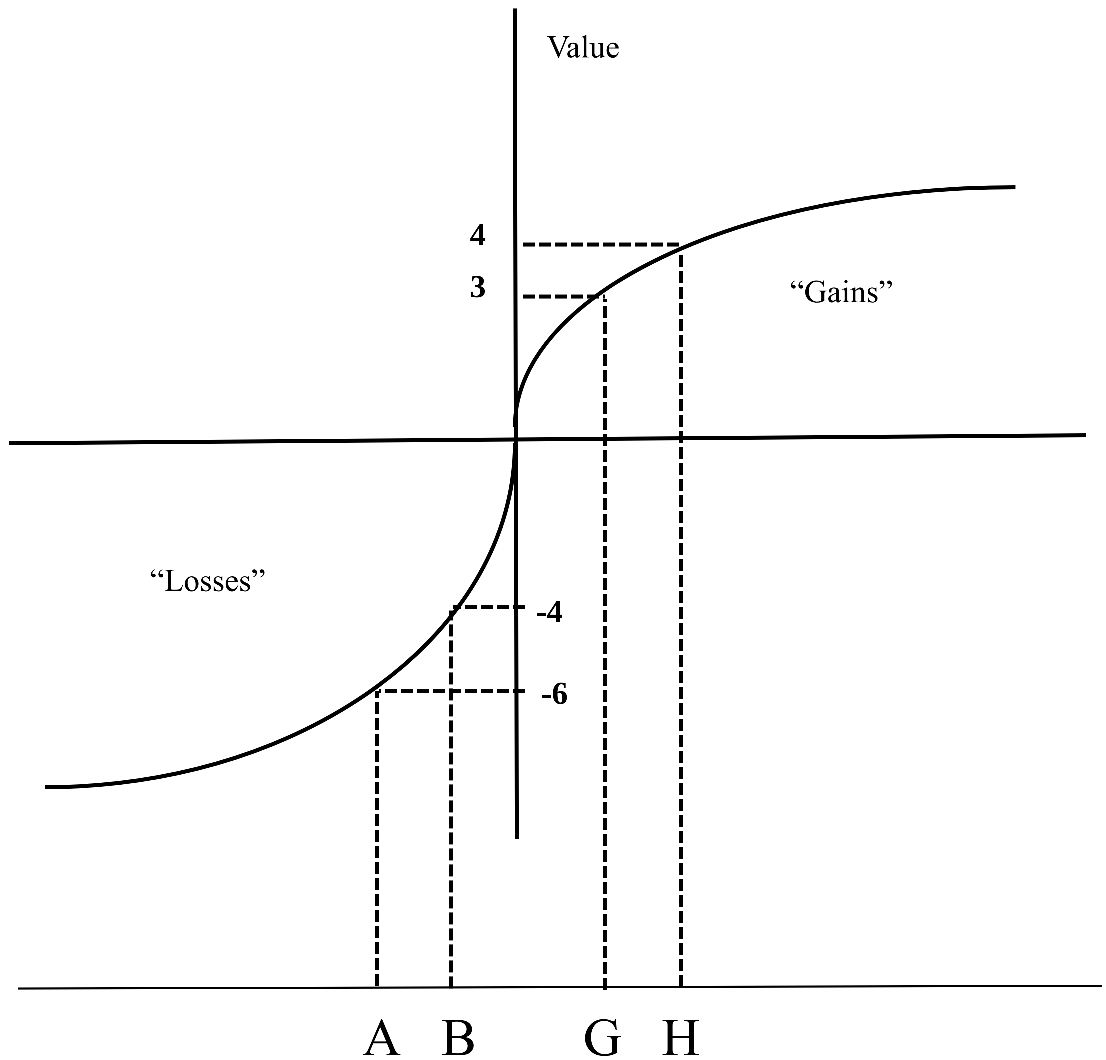

FIGURE 2: MARKOWITZ (1952) DOUBLE-KINKED VALUE FUNCTION