Where Does My Time Go?! The Trap of Segregated Time

A Thesis

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ABSTRACT

According to the arithmetic rules of mental accounting (ARMAs), given multiple gains, people tend to prefer them to be segregated, whereas for multiple losses, people tend to prefer them to be aggregated (Thaler 1985). This project hypothesized that people's value function of time follows the ARMAs, such that they would prefer segregated time-gains and aggregated time-losses. In addition to hedonic editing, this project also examined the endowment effect using time as the object. We hypothesized that people's value of time would follow the endowment effect such that they would have a higher willingness to accept (WTA) for time losses than their willingness to pay (WTP) for time gains. Through four online studies, we found that people place more value on aggregated time-gains and require less compensation for segregated time-losses, and expect higher compensation for time lost than payment for the same amount of time gained. Thus, we rejected the first hypothesis, though accepted the second, as people's value of time contradicts the ARMAs while following the endowment effect.

BIOGRAPHICAL SKETCH

Wenxue Zheng holds a B.A. in Computational Mathematics and a B.A. in Business Management Economics from the University of California, Santa Cruz. She recently completed her M.S. at Cornell University's Dyson School of Applied Economics and Management. She is going to pursue her Ph.D. degree in Management with a concentration in Marketing in the Fall.

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Finally, thanks to my parents for being with me all the time, regardless of what decisions I made. Thanks to my aunt and uncle for all the supports during these six years in the United States. Thanks to myself for keeping following your heart and looking for a direction at sea.

Hope you can be more confident in the future, preserve your optimism, idealism, and passion for your future research and life!

Wenxue Zheng

May 15, 2020

One Hour before My 24th Birthday

At Cornell University, Ithaca, New York

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Where Does My Time Go?! The Trap of Segregated Time

Introduction

Time and money are both limited but significant resources. Many North Americans have indicated that they do not have enough money and time for everything they want (DeVoe & Pfeffer 2011; Rheault 2011). As it is usually irrealistic to gain both time and money at the same time, we are often facing situations to make trade-offs between these two resources. So, this project will examine the behaviors and patterns related to the trade-off between time and money. Regarding individuals' behaviors related to money, mental accounting play significant roles. As a set of cognitive operations, people use it to organize, evaluate, and keep track of financial activities. One of the components of mental accounting that receives the most attention is about how outcomes are perceived and experienced, and how decisions are made and subsequently evaluated (Thaler 1999).

At the starting point of the development of mental accounting, Richard Thaler argued in *Mental Accounting and Consumer Choice* that consumers often fail to behave in accordance with economic theories, and used the value function $v(\cdot)$ developed by Kahneman and Tversky in 1979 to replace the utility function from economics theory (Thaler 1985). The shape of the value function $v(\cdot)$ brought three behavioral principles, each of which captures an essential element of mental accounting. The first is that $v(\cdot)$ is based on the relative gains and losses compared to some reference points,

and focuses on changes, instead of the wealth levels as in expected utility theory. The second is that the function is concave for gains and convex for losses ($v''(x) < 0, x > 0; v''(x) > 0, x < 0$). This feature reflects the basic psychophysical principle (the Weber-Fechner law) that the difference between \$10 and \$20 seems bigger than the difference between \$1000 and \$1010, for both positive and negative signs (Thaler 1999). Moreover, this feature lead to the facts that v(x)+v(y) > v (x+y) when x, y > 0 and v(x)+v(y) < v(x+y) when x, y < 0. These facts indicate that given multiple gains, people tend to prefer them to be segregated, whereas for multiple losses, people tend to prefer them to be aggregated (Thaler 1985), called the Arithmetic Rules of Mental Accounting (ARMAs) in this project. The third is about loss aversion, which states that losing \$100 hurts more than gaining \$100 yields pleasure: v(x)< -v(-x). This third principle reflects how people will demand more sell an item they own than they would be willing to pay to acquire the same item (Thaler 1980), and is called the endowment effect.

In this project, we examined whether the value of time followed the ARMAs and the endowment effect, and had two main hypotheses:

H1: People's value of time follows the ARMAs such that segregated time-gains and aggregated time-losses are preferred. Correspondingly, people have higher WTP and lower WTA for them.

H2: There exists an endowment effect of time such that people expect higher compensation for time-losses than for the same amount of time gained.

Mental Accounting and Consumer Behavior

While the value function of prospect theory contained only one outcome, the analysis in mental accounting introduces compound outcomes in the same dimension. The ARMAs include two ways of coding the two outcomes. One way is to consider both outcomes as aggregated, i.e., $v(x+y)$, while the other is to consider them as segregated, i.e., $v(x)+v(y)$. There are four possible outcomes the ARMAs state for how individuals mentally code the combinations of gains and losses, including multiple gains, multiple losses, mixed gains, and mixed losses. In this project, we focused on the first two combinations for the joint outcome (x, y).

Through the hedonic editing hypothesis, decision-makers are assumed to be value maximizers who will try to code outcomes to make themselves as happy as possible, and mentally segregate or integrate outcomes depending on which mental representation is more desirable (Lim 2006), which means that $v(x \& y) = Max[v(x+y), v(x)+v(y)]$ (Thaler 1985, 1999). So, for a joint outcome (x, y), people try to integrate outcomes when integrated evaluation yields higher value than separate evaluations and try to segregate outcomes when segregation yields higher value. Consequently, regarding multiple gains, due to the concave shape of v,

$v(x)+v(y)>v(x+y)$, the segregated gains should be preferred (figure 1). This arithmetic rule was supported by a study in which 56 out of 87 undergraduate students at Cornell regarded a person who won $50 and $25 in two separate lotteries as happier than the person who won $75 from one single lottery, while only 16 out of 87 participants believed the reverse. Regarding multiple losses, as $v(-x)+v(-y)<v(-(x+y))$, the integration of multiple losses should be preferred (figure 2). One example is how credit cards usually pool many small losses into one larger loss to reduce the total value lost. This coding rule about multiple losses was also supported by a study in which 66 out of 87 participants thought a person who was told they owed $100 and $50 in two separate letters was more upset than another person who received a letter about owing $150 (Thaler 1985, 2008).

Previous studies had suggested that these coding rules of mental accounting play important roles underlying different financial behaviors. For example, Shefrin and Statman (1993) suggest that mental accounting principles may guide the design of financial products. Brokers promote covered calls by framing the cash flow of a covered call into "three sources of profit"—the call premium, the dividend, and the capital gain on the stock. By segregating gains, brokers can make covered calls more attractive to their clients (Lim 2006).

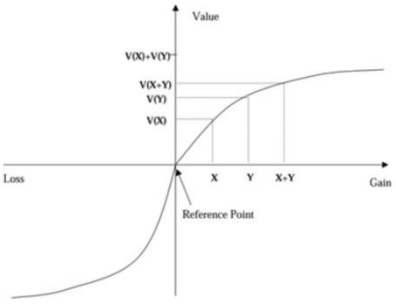


FIGURE 1
SEGREGATED GAINS

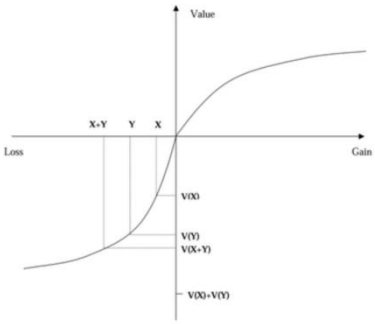


FIGURE 2
AGGREGATED LOSSES

Mental accounting is also an important factor underlying firm and investor behaviors. The principles of mental accounting indicate that stock prices will be, on average, higher if the manager spreads out good news over time smoothly. In contrast, for sufficiently bad news, it is better to report a big loss and possibly improved profits in a later period rather than two separate losses (e.g., Koch and Wall 2000; Kirschenheiter and Melumad 2002). Regarding investors' trading decisions, investors were found more likely to sell multiple stocks when they realize losses ("losers") than gains ("winners"). Selling losers on the same day makes it easier for investors to aggregate their losses, and selling winners on different days makes it easier to segregate their gains. Therefore, such selling behaviors of investors are consistent with the individual's preference for integrating losses and segregating gains (Lim 2006).

Despite the abundance of research regarding the ARMAs, most of them were focusing on the domain of money. So, it is worth examining the ARMAs and exploring

whether the ARMAs exist in more diverse scenarios. Thus, to fill the gap and examine the ARMAs using resources besides money, this project will explore the ARMAs using time as a medium by comparing participants' awareness and value of aggregated time gains/losses with segregated ones. Also, past studies (e.g., Thaler 1985, 1990, 1999; Chang and Chen 2014) tended to use single choice questions that asked participants to choose one from two persons who they believe would be happier. There is some additional information we get from our experiments: (1) instead of thinking about others, participants were thinking about themselves, and (2) instead of thinking about happiness and frustration, we test other reactions like the level of irritation, or monetary value given to the gains and losses, by making the gains and losses, not about money, but time.

The Endowment Effect

The shape of the value function implies three behavioral principles:

(1) $v(\cdot)$ is based on the relative gains and losses compared to some reference points.

(2) The function is concave for gains and convex for losses ($v''(x) < 0, x > 0; v''(x) > 0, x < 0$), which causes the ARMAs.

(3) The loss function is steeper than the gain function, $v(x) < -v(-x), x > 0$, which indicates that losses loom larger than gains.

The third principle (figure 3) reflects how people will demand more sell an item they own than they would be willing to pay to acquire the same item (Thaler 1980), and is called the endowment effect. In economics, this is usually shown as people's maximum willingness to pay (WTP) to buy an object being typically lower than the least amount they are willing to accept (WTA, i.e., the minimum amount of money to abandon a good) to sell that same object when they own it (Kahneman, Knetsch, and Thaler 1990). For example, Ziv Carmon and Dan Ariely (2000) found that participants' hypothetical WTA for NCAA final four tournament tickets were 14 times higher than their hypothetical WTP. Regarding the endowment effect from the perspective of exchange, people given a good are reluctant to trade it for another good of a similar value. For example, participants who were first given a Swiss chocolate bar were generally unwilling to trade it for a coffee mug, whereas participants who were first given the coffee mug were generally unwilling to trade it for the chocolate bar (Kahneman, Knetsch, and Thaler 1991). The endowment effect also describes the tendency for people who own a good to value it more than people who do not. It creates market inefficiencies and irregularities in valuation, such as differences between buyers and sellers, reluctance to trade, and mere ownership effects (Morewedge and Giblin 2015).

Another study showed that workers worked harder to maintain ownership of a provisional awarded bonus than they did for a bonus framed as a potential yet-to-be-awarded gain (List 2012). In addition to these examples, the endowment

effect has also been observed using different goods (Hoffman and Spitzer 1993) in a wide range of diverse populations, including children (Harbaugh, Krause, and Lise 2001), great apes (Kanngiesser, Santos, Hood, and Call 2011), and new world monkeys (Lakshminaryanan, Chen, and Santos 2008). Despite the abundance of research examining or supporting the endowment effect, past experiments mostly used material goods. However, whether our valuation of non-material goods, like time, follows these rules was undefined. So, this project also explored the ARMAs and endowment effect using time as a medium.

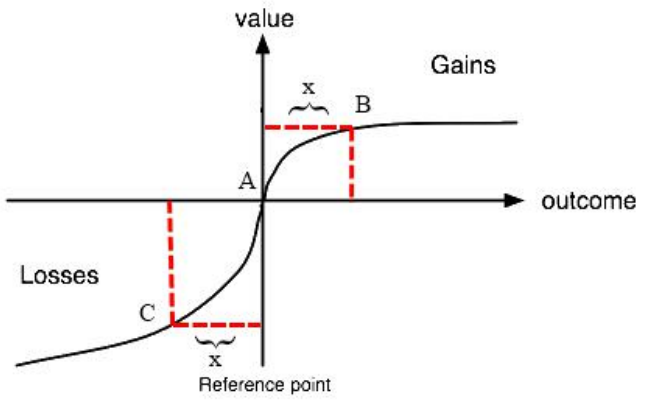


FIGURE 3
LOSSES LOOM LARGER THAN GAINS

Time-Saving and Quantity Estimation

In quantity estimation, people often perceive that the whole is less than the sum of its parts. Past studies have shown that participants in the unpacked condition (i.e., when time is viewed as segregated periods instead of a whole) judged a given time interval as longer than those in the packed condition. This effect existed even as the time interval was kept constant between the two conditions, suggesting that unpacking a

time interval may be a good strategy for lengthening its perceived temporal distance (Liu, Li, and Sun 2014).

Previous studies had shown that people tend to buy time-saving products and services like washing machines, child care, dishwashers, and prepared meals when they are getting busier. For example, a working wife was found to significantly increase the likelihood of the family's ownership of several time-saving durables and the frequency of purchasing meals away from home (Kim 1989), and consumers' time availability was found to be an important segmentation variable in the convenience and fast-food markets (Darian and Cohen 1995). In addition, consumers had shown their willingness to pay for invisible services, like spending roughly $30 for reducing an hour of commute time (Brownstone et al. 2003). However, consumers' preferences among time-saving products, and how those preferences were affected by the perception of time, had never been examined.

Also, several studies have shown that consumers have a perception bias on time, including time-estimating and time-saving. However, the main focus of those studies was on driving speeds. It has been proven that people usually underestimate the time-saving effect when they accelerate from relatively low speed to an average speed, but overestimate the impact of accelerating from average speed to an over-speed (e.g., Svenson 2008, Peer and Gamliel 2013), while the effect of time-saving bias about

different amounts of time-saving on consumption choice was missing. Meanwhile, the research about the accumulation effect (i.e., aggregation) of time-saving is also missing. The only studies related to the accumulation effect were about money and bundling effects on product sales (e.g., List 2002). So, the literature gap on the accumulation effect of time was still waiting to be filled.

Overview of the Studies

To measure the value of time, one could study time in context (e.g., the allocation of time to tasks) or out of context (e.g., the value of time, independent of a specific use). The advantage of studying time in context is that the activities performed in a given time are a significant contributor to the value of that period, as time is what you make of it. The disadvantage of studying time in context is that its value is idiosyncratic to the activity being performed. Studying time out of context solves that particular problem (Festjens and Janiszewski 2015); however, one problem associated with studying time without context is that it is abstract and creates a feeling of unreality for participants trying to imagine such scenarios. So, we began studying time using a non-familiar contextualized setting, to prevent the disadvantage of both contextualized and non-contextualized scenarios, by minimizing the influence of contextualization on its value and keeping the setting easy to imagine and realistic.

So, study 1 started by investigating the difference between people's valuing of aggregated and segregated time, using within-subject comparisons, through unfamiliar but realistic scenarios. Studies 2 and 3 examined the differences between people's valuing of aggregated and segregated time using between-subject comparisons in familiar, real-life scenarios. In study 4, participants assigned to segregated conditions needed to answer questions about each individual time-gain and time-loss. All four studies also examined the endowment effect using within-subject comparisons. The results of the first three studies rejected the first hypothesis and found that time followed reversed ARMAs, but supported the second hypothesis that there existed an endowment effect of time. The result of the last study was more complicated. In the general discussion section, we provided a fuller discussion of the potential explanations and the implications of our findings.

Study 1

Procedure. Study 1 investigated the difference between people's values of aggregated and segregated time, and the difference between people's WTP for time-gains and WTA for time-losses. There were four scenarios. Participants were asked to imagine two scenarios that involved filling out a survey for 30 minutes and waiting for 30 minutes. The survey is composed of six sections, each taking around five minutes to complete.

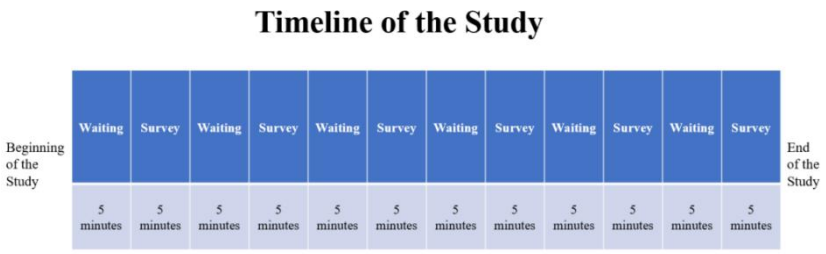


FIGURE 4
TIMELINE OF SCENARIO (A) AND (C)

For the first two scenarios, the compensation for each study was $20, and participants could eliminate the waiting time by giving up a portion of their payments. In scenario (A) - Segregated Time-Gains, the 30-minute waiting time comprised six five-minute segregated waiting intervals. Before each section of the survey, participants were made to wait five minutes. The timeline of the study is shown in figure 4. In scenario (B) - Aggregated Time-Gains, the 30-minute waiting time occurred contiguously at one point during the study (figure 5). After reading the descriptions, participants were asked to indicate their likelihood of participating in the study and degrees of irritation about the waiting time if the participation is obligatory. Then, participants were told that they could eliminate the waiting time by giving up a portion of their payments such that they would only need to spend 30 minutes filling out surveys without any waiting time (figure 6). After reading the additional information, participants indicated the maximum number of dollars they would be willing to pay to skip the 30-minute wait if given the option to forgo it for each of the scenarios.

Timeline of the Study

FIGURE 5
TIMELINE OF SCENARIO (B) AND (D)

For the next two scenarios, participants were asked to imagine two scenarios that involved filling out a survey for 30 minutes, with the 30-minute wait time in (A) and (B) becoming optional instead of required. The base compensation for each scenario was $10. The timeline of the study without adding optional waiting time is shown in figure 6. After reading the descriptions, participants were asked to indicate their likelihood of participating in the study. Then, participants had to choose whether to add the optional 30-minute wait time, for which they would receive more payment. In Scenario (C) - Segregated Time-Losses, the 30-minute optional wait time comprised six five-minute segregated waiting intervals, while in Scenario (D) - Aggregated Time-Losses, the 30-minute optional wait time occurred contiguously. So, if participants volunteered to wait or "sell" their time for money, they would wait five minutes before each section of the survey (figure 4) in (C) and 30 minutes at one point (figure 5) in (D). Participants then indicated their likelihood of volunteering to wait and their minimum number of dollars they would be willing to accept for an extra 30-minute wait for each of the scenarios.

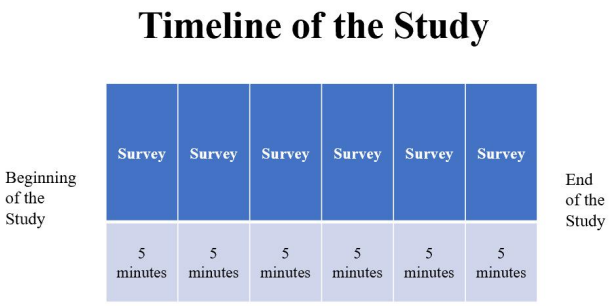


FIGURE 6
TIMELINE OF SCENARIOS (NO WAITING)

In study 1a, each participant was asked to imagine scenarios (A), (B). In study 1b, participants imagined scenarios (C), (D). In study 1c, each participant was asked to imagine scenarios (A), (C). In study 1d, participants imagined scenarios (B), (D).

Participants. Participants for each study were 190 adults (56.91% male, median age = 33, median education = "Bachelor's degree"), 190 adults (59.24% male, median age = 33, median education = "Bachelor's degree"), 170 adults (61.6% male, median age = 32, median education = "Bachelor's degree"), and 170 adults (57.7% male, median age = 35 , median education = "Bachelor's degree") for studies 1a, 1b, 1c, and 1d, correspondingly. They were recruited through Amazon Mechanical Turk (MTurk) and paid a fee of $0.80. In studies 1a and 1b, the participants were assigned to both conditions in a random order.

Data Description. For all scenarios, participants' likelihood of participating in the study was measured through a Likert scale [1-7], with higher numbers representing the higher likelihood of participating in the study. For scenarios A and B, the degree of irritation for study 1b was measured through a Likert scale [1-5], with higher numbers representing a higher degree of irritation. Participants' WTP was measured using dollar values. For scenarios C and D, participants' likelihoods of volunteering to wait were measured through a Likert scale [1-7], with higher numbers representing higher likelihood to volunteer to wait. Participants' WTA was measured using dollar values. The outliers that were three standard deviations away from their means were dropped and not included in the analysis.

Results. In study 1a, three paired t-tests were run for within-subject comparisons of participants' likelihoods to participate, degree of irritation, and WTP for skipping the waiting. The results of the study 1a are shown in figures 7 and 8. When the waiting time was aggregated (vs. segregated), participants were less likely to participate in the study *(M_a = 4.647, M_s = 4.880, d = -0.234, p = 0.008)* and had higher WTP for eliminating waiting when their participation in the study was obligatory *(M_a = \$5.451, M_s = \$4.875, d = \$0.576, p = 0.023)*. The difference between degrees of irritation was not significant between the two groups.

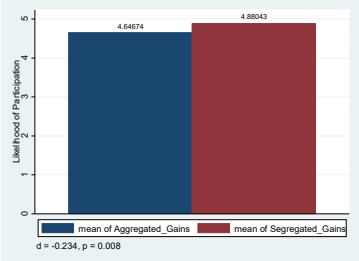


FIGURE 7
PARTICIPATION: SEGREGATED VS AGGREGATED WAITING TIME

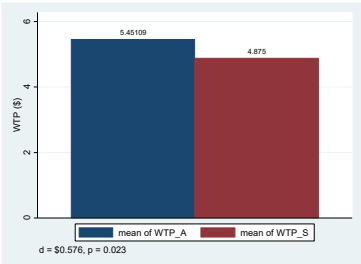


FIGURE 8
WTP: SEGREGATED VS AGGREGATED TIME-GAINS

When the participants chose to participate in the lab study with waiting time, they were choosing to exchange their time for money. Figure 7 implied that when facing the trade-off between time and money, people were more likely to choose a time when it was aggregated. A WTP for eliminating the waiting time, which was inevitable through other ways, reflected participants' value of time gains. So, figure 8 showed that people value the aggregated time-gains over the segregated ones, which contradicted the ARMAs that segregated gains should be preferred.

In study 1b, three paired t-tests were run for within-subject comparisons of participants' likelihoods to participate, the likelihood of volunteer to wait, and WTA

for extra waiting. The results of study 1b are shown in figure 9. Participants' likelihoods to participate before each of the scenarios was not significantly different. This result served as a pre-test, which made sure that participants' attitudes were the same for both scenarios before the waiting time was introduced (as these two scenarios were identical without adding waiting time). When the waiting time was aggregated (vs. segregated), participants had higher WTA for waiting an extra 30 minutes *(M_A = \$7.988, M_s = \$4.480, d = \$0.509, p = 0.059)*. The difference between likelihoods to volunteer was not significant between the two groups.

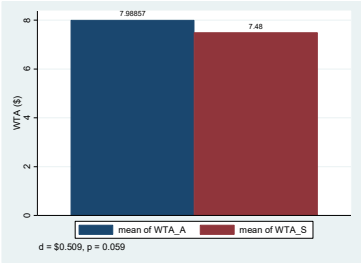


FIGURE 9
WTA: AGGREGATED VS SEGREGATED TIME-LOSSES

A WTA for adding extra waiting time reflected participants' monetary value of time losses. So, figure 9 showed that people disliked the aggregated time-losses more than the segregated ones, as they would spend more on preventing them. This result also contradicted the ARMAs that aggregated losses should be preferred.

The results of studies 1c and 1d in figures 10 and 11 show that participants had higher WTA (i.e., they required higher compensation) for the extra waiting time than their WTP for eliminating the assigned waiting time for both segregated (M_{WTA} = \$7.200, M_{WTP} = \$4.275, d = \$2.925, p = 0.00) and aggregated waiting times (M_{WTA} = \$6.396, M_{WTP} = \$4.970, d = \$1.427, p = 0.025). As the endowment effect means that WTA is larger than WTP, these results showed that the endowment effect existed for both aggregated and segregated time.

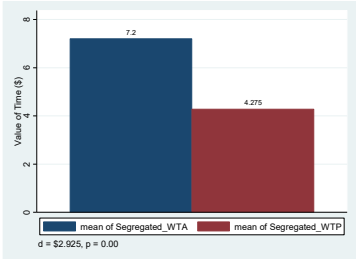


FIGURE 10
ENDOWMENT EFFECT OF SEGREGATED TIME

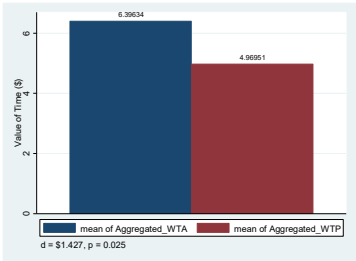


FIGURE 11
ENDOWMENT EFFECT OF AGGREGATED TIME

Discussion. In study 1, we denied our first hypothesis, as participants did not show the expected preference for segregated time-gains and aggregated time-losses. In reverse, in study 1a, their WTP for aggregated time-gains was significantly higher

than their WTP for segregated time-gains, and their WTA for segregated time-losses was significantly higher than that for aggregated time-gains in study 1b. The second hypothesis was supported by study 1c and study 1d, as participants showed higher WTA for time-losses compared to their WTP for the same amount of time-gains.

Study 2 - "Choosing a Hotel"

Procedure. Participants were asked to imagine attending a meeting at hotel A. They were given the option to stay there or at another, cheaper hotel (hotel B) that was identical to hotel A except for needing to take a free shuttle. Half the participants were assigned to a scenario in which they needed to go to the conference once without returning to the hotel afterward, and the driving distance was 60 minutes between hotel A and hotel B. Another half of the participants were told that the conference would last for two days, and hotel B was 15 minutes away from the conference when taking the shuttle. They would spend 15 minutes on four separate occasions traveling back and forth between hotel B and the conference if staying at hotel B. After reading the description of their assigned scenarios, participants were asked to indicate how irritated they felt about their assigned traveling time to the conference, how likely they would be to choose B given the assigned transportation time, and the number of additional dollars they would be willing to pay (WTP) for hotel A compared to the cheaper option, hotel B, to save on transportation time. Then, participants thought about whether the conference host provided them with a room at hotel A, but another

person living in hotel B wanted to switch room to hotel A. Participants indicated the minimum number of dollars (WTA) that they would need to be paid to switch.

Table 1: Demographic Information 1

	Age	Married*	Male**	Income
Aggregated	31.646	40.625%	46.316%	$56145.83
Segregated	30.078	50.000%	62.376%	$58431.37
Difference	1.5674	-9.375%	-16.060%	$ -2285.54
P-Value	0.1913	0.0937	0.0120	0.3034

Table 2: Demographic Information 2

	USA	India	Europe**	Others
Aggregated	75.000%	14.583 %	4.167 %	5.20833%
Segregated	80.392%	15.686%	0.000%	1.96078%
Difference	-5.392%	-1.103%	4.167%	3.24755%
P-Value	0.1821	0.4149	0.0187	0.1091

Participants. Participants for study 3 were 206 adults recruited through Mechanical Turk (MTurk) and paid a fee of $0.80. Participants were assigned to either aggregated or segregated conditions randomly. The demographic information and the results of testing of randomization are shown in tables 1 and 2. There were 9.375% less married participants, 16.060% less male, and 4.167% more European for the aggregated group. So we tested the effect of these factors as well.

Data Preparation. Participants' degree of irritation and likelihood of choosing hotel B were measured through a Likert scale of [1-5] and [1-7], respectively, with higher numbers for a higher degree of irritation and likelihood to choose hotel B. Participants' WTP and WTA were measured using dollar values. The outliers that were three standard deviations away from their means were dropped and not included in the analysis.

Results. In study 3, when the transportation time was aggregated (vs. segregated), participants felt more irritated about the transportation time (MAggregated = 1.708, MSegregated = 1.373, d = 0.338, p = 0.043) (Figure 12). This result reflects that when the transportation time existed separately with temporal spacing in between, people would be less irritated about the transportation time.

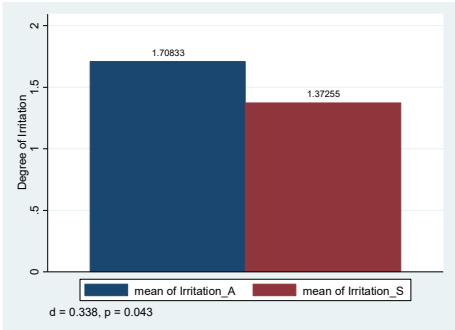


FIGURE 12
IRRITATION: AGGREGATED VS SEGREGATED WAITING TIME

In addition, the participants were willing to pay more to switch from hotel B to hotel A for eliminating the aggregated transportation time *($M_{Aggregated}$* = \$21.101, $M_{aggregated}$ =

$14.323, *d = $6.778, p = 0.0013)* (Figure 13). This result reflected the participants' value of transportation time-saving. There was no significant difference between the two groups for their indicated likelihood of choosing hotel B and WTA for switching from hotel A to hotel B.

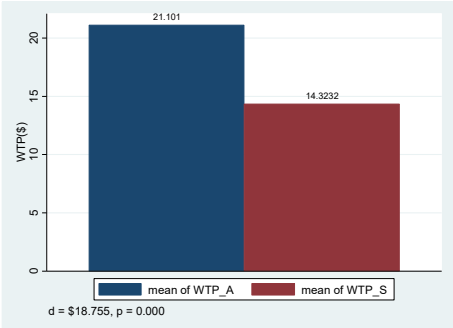


FIGURE 13
WTP: AGGREGATED VS SEGREGATED TIME-GAINS

The existence of the endowment effect of time was again supported by the results from the aggregated scenario (WTA_A = $34.37, WTP_A = $21.101, d = $13.269, p = 0.000) (Figure 14) and the segregated scenario (WTA_S = $36.451, WTP_S = $14.3232, d= $22.128, p = 0.000) (Figure 15). The results indicate that if people firstly expect to spend no time on transportation, when asked to move to somewhere else that needs transportation time, their expected minimum compensation would be higher than their potential maximum payment for the exchange in a reversed way.

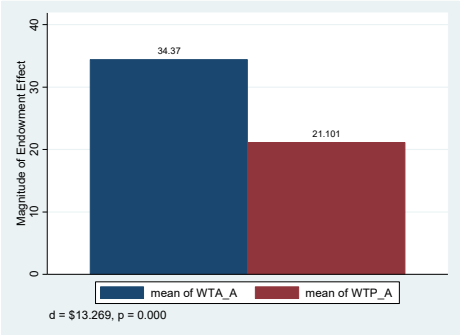


FIGURE 14
ENDOWMENT EFFECT OF AGGREGATED TIME

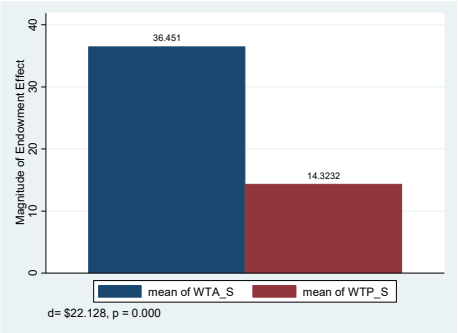


FIGURE 15
ENDOWMENT EFFECT OF SEGREGATED TIME

In order to make sure that this effect is not caused by the difference in marital status, gender, and location between the two groups, we also conducted the t-tests between two groups by these factors. Although some were less statistically significant, the effect was the same for participants' WTP and endowment effect for both married and non-married, male and female, European and others. Therefore, we concluded that the previous effects were not caused by these demographic differences.

Discussion. The results of study 2 were consistent with studies 1 in that the value of time does not follow the ARMAs, but the reversed ones instead, while the endowment effect of time was supported again as participants showed higher WTA for time-losses compared to their WTP for the same amount of time-gains. Also, although there were differences in gender, location, and marital status between the two groups, our additional tests eliminate the possibility that these effects were caused by the demographic differences.

The results of study 2 implied the significance of locating the hotel close to the tourist attractions and business center. As for the hotels that are already built, business owners should take the traveling time to costumers' destinations into account when setting up the prices. In addition, when competing with others with advantages in location, a certain discount could help. As for the event holders, the results of this study could help them design the event ticket price and hotel arrangement, to maximize their attendees' satisfaction.

The first two studies included temporal spacing when segregating the waiting and transportation time. For study 1, each segregated waiting was separated by 5-minute lab-studies. For study 2, the participants were expecting to attend conference between the first (from Hotel B to A) and the second (from A to B), third and the fourth traveling time. The first two traveling times were in a different day from the latter two.

As it could be possible that the effects found in the first two studies were affected by temporal spacing, we eliminated it in study 3. Both groups were getting exactly the same, continuous-time, but one framed as aggregated, while the other frame as segregated.

Study 3 - "Waiting at Disneyland"

Procedure. Study 3 examined the differences between people's valuing of aggregated and segregated time using between-subject comparisons in real-life scenarios, as well as the endowment effect of time using within-subject comparisons. Participants were asked to imagine being at Disneyland and considering whether or not to go on a popular ride. Half the participants were told that they would have to spend 90 minutes waiting in line before taking the ride. The other half were told that they had to wait in three 30-minute lines (i.e., one to enter the building, one to move from the entrance to upstairs, and one to wait on the second floor) before taking the ride. After reading the description of their assigned scenarios, participants were asked to indicate how irritated they felt about having to wait 90 minutes/three 30-minutes and how likely they would be to decide not to take the ride because of their assigned waiting time. Then, all participants were introduced to an app called No-More-Waiting that had partnered with the amusement park. The app allowed consumers to skip the wait. It offered an option for skipping the wait and going on the ride straight away. Participants had to indicate the maximum number of dollars they

would be willing to pay to skip the waits. Afterward, participants imagined another situation in which they had won a prize from the No-More-Waiting app. The prize allowed them to skip the 90-minute wait for free. They could either choose to use the reward or receive cashback from Disneyland by giving up their prize and waiting. In the end, participants indicated the minimum number of dollars that would make them give the award back to Disneyland, such that they would have to wait for 90 minutes before taking the ride.

Table 3: Demographic Information 1

	Age	Married	Male**	Income
Aggregated	31.40404	49.495%	52.525%	$53,737
Segregated	30.92784	46.392%	65.979%	$53,918
Difference	0.4762054	3.103%	-1.345%	-$1801.52
P-Value	0.3988	0.3328	0.0279	0.4825

Table 4: Demographic Information 2

	USA	India	Europe	Others
Aggregated	73.737%	13.131%	4.040%	5.051%
Segregated	80.412%	10.309%	3.093%	3.093%
Difference	-6.675%	2.822%	0.948%	1.958%
P-Value	0.1345	0.2709	0.3612	0.2456

Participants. Participants for each study were 206 adults who were recruited through Mechanical Turk (MTurk) and paid a fee of $0.80. Participants were assigned

to either aggregated or segregated conditions randomly. The demographic information for both groups is shown in tables 1 and 2. The average age and income, percentage of marriage status, and location of people in both groups were not significantly different, which implied that the randomization worked for this demographic information. However, there were 1.345% fewer males in the aggregated group, so we tested the effect on the value of time by gender.

Data Preparation. Participants' degree of irritation and likelihood of not taking the ride was measured through a Likert scale of [1-5] and [1-7] respectively, with higher numbers representing a higher degree of irritation and likelihood to wait for the ride (i.e., lower likelihood to leave because of the wait). Participants' WTP and WTA were measured using dollar values. The outliers that were three standard deviations away from their means were dropped and not included in the analysis.

Result. As shown in figure 16 and 17, we found that when the waiting time at Disneyland was aggregated (vs. segregated), participants felt more irritated *(M_A = 3.000; M_s = 2.747, d = 0.253, p = 0.0726)* and were more likely to give up waiting (M_A = 4.959; M_s = 4.061, d = 0.898, p = 0.0001*)*. These results implied that, by simply framing the waiting time as smaller, separated ones, amusement parks could make people feel less irritated and decrease their likelihood of leaving.

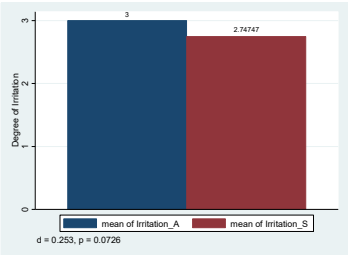


FIGURE 16
IRRITATION: AGGREGATED VS SEGREGATED WAITING TIME

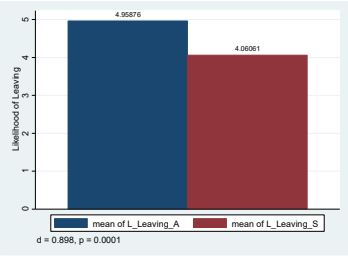


FIGURE 17
LEAVING: AGGREGATED VS SEGREGATED WAITING TIME

In addition, participants' WTP for the aggregated waiting time was higher than that for segregated time, while the difference was not significant. Participants also requested higher compensation (WTA) for aggregated (vs. segregated) waiting times when they were told that they won the prize for eliminating the waiting time *(d = $12.857, p = 0.0002),* as shown in figure 18. This result reflected that, when the time was framed as a whole, participants needed compensation of $29.4314 to give up the chance of skipping 30 minutes waiting. However, when the time was framed as three individual 10 minutes, participants only needed $16.5745 compensation. As WTA is an indicator of value of time, this result implies that by describing time in different ways, we can vary consumers' value of time. A segregated framing could significantly decrease people's time value.

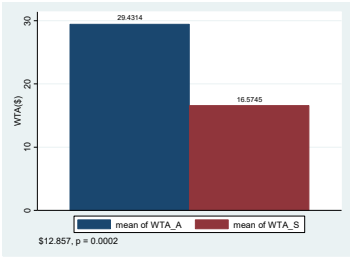


FIGURE 18
WTA: AGGREGATED VS SEGREGATED TIME-LOSSES

We also examined the endowment effect by having within-subject comparisons for participants' WTP and WTA for each group. The participant had a higher WTA for time-losses compared to the same amount of time-gains in both aggregated (WTA_A = \$29.431, WTP_A = \$10.677, d = \$18.755, p = 0.000) and segregated scenarios (WTA_S = \$16.575, WTP_S = \$9.268, d = \$7.306, p = 0.000). The results are shown in figures 19 and 20.

In order to make sure that this effect is not caused by the gender difference between two groups, we also conducted t-tests between the two groups for males and females, respectively. The effect was the same in terms of participants' likelihood of leaving, WTA, and endowment effect for both male and female. The participants' degree of irritation was only significant in the male group. However, there was no significant gender difference in irritation within both groups, so we concluded that the effects we found were not caused by gender.

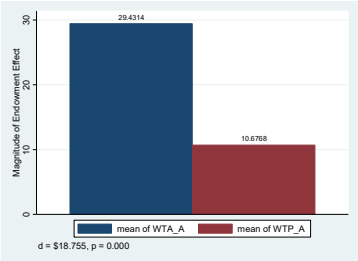


FIGURE 19
ENDOWMENT EFFECT OF AGGREGATED TIME

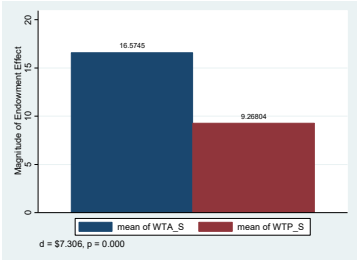


FIGURE 20
ENDOWMENT EFFECT OF SEGREGATED TIME

Discussion. The results of study 3 were consistent with study 1 and 2, in that participants felt more irritated and were more likely to leave when the waiting time was aggregated. Their WTA for segregated time-losses was significantly higher than that for aggregated time-gains. However, the existence of the endowment effect of time was again supported by the results from both aggregated and segregated scenarios, as participants showed higher WTA for time-losses compared to their WTP for the same amount of time-gains. Also, although there was a gender difference between the two groups, our additional tests eliminate the possibility that the effects were caused by gender.

Study 3 proved that even without the temporal distance between the segregated time-gains and -losses, the aggregated time-gains, and segregated time-losses were preferred. These results imply that for some businesses like an amusement park that waiting is hard to avoid, framing the waiting time as segregate could benefit both the business owners and the costumers. Studies 1, 2, and 3 required only one payment for segregated groups. In study 4, we required the participants to make separate payments for a segregated time.

Study 4 - Waiting for Meals and Drinks

Procedure. In both studies, participants read the descriptions about waiting at a restaurant (Study 4a) and café (Study 4b) and were randomly assigned to either aggregated or segregated conditions evenly. For the aggregated group in study 4a, participants were asked to imagine needing to wait for 30 minutes in total before getting their meals in a restaurant, and for the aggregated group in study 4b, participants were asked to imagine needing to wait for 15 minutes in total before getting their drinks in a café. Then, participants were asked to indicate how irritated they felt about having to wait 15 or 30 minutes and how likely they would be to leave the restaurant/café because of their assigned waiting time. Then, all participants were introduced to an app called No-More-Waiting that had partnered with the restaurant/café to allow consumers to skip the wait and offered an option for skipping the wait and getting the foods/drinks immediately. Participants had to indicate the

maximum number of dollars they would be willing to pay to skip the waits. Afterward, participants imagined another situation in which they had won a prize from the No-More-Waiting app. The prize allowed them to skip the wait for free. They could either choose to use the reward or receive cashback by giving up the prize and waiting. In the end, participants indicated the minimum number of dollars that would make them give the award back, such that they would have to wait before getting the foods/drinks. For the segregated groups, participants answered the same questions, but separately, about waiting 10/5 minutes to order, 10/5 minutes to pay, and 10/5 minutes to wait for the meals/drinks to be prepared.

Table 5: Demographic Information 1

		Age	Married	Male	Income
Waiting for a Meal	Aggregated	28.84	49.000%	61.616%	$59500
	Segregated	31.04	40.000%	57.000%	$55000
	Difference	-2.2	9.000%	4.616%	$4500
	P-Value	0.1182	0.101	0.255	0.1591
Waiting for a Drink	Aggregated	28.20	36.00%	61.224%	$58,100
	Segregated	30.52	42.00%	56.000%	$57,900
	Difference	-2.32	-6,00%	5.224%	$2,000
	P-Value	0.0829	0.1935	0.2290	0.4815

Table 6: Demographic Information 2

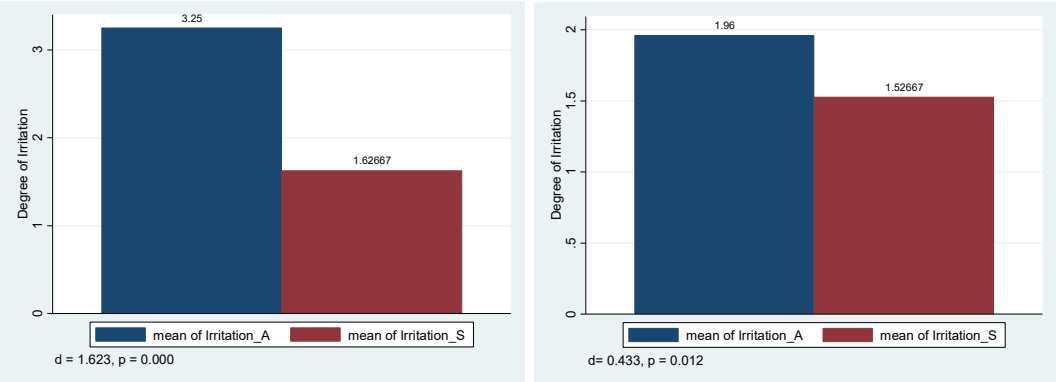
		USA	India	Europe	Others
Waiting for a Meal	Aggregated	70.000%	23.000%	2.000%	2.00%
	Segregated	72.000%	19.000%	4.000%	2.00%
	Difference	2.000%	4.000%	-2.000%	0.00%
	P-Value	0.3784	0.2449	0.2048	1.000
Waiting for a Drink	Aggregated	73.000%	19.000%	4.000%	1.00%
	Segregated	78.000%	13.000%	4.000%	2.00%
	Difference	-5.000%	6.000%	0.000%	-1.00%
	P-Value	0.2068	0.1247	1.000	0.2815

Participants. Participants for each study were 206 adults recruited through Mechanical Turk (MTurk) and paid a fee of $0.80. Participants were assigned to either aggregated or segregated conditions randomly. The demographic income information for both groups is shown in tables 5 and 6. Every demographic information was completely randomized.

Data Preparation. Participants' degree of irritation and likelihood of staying in the restaurant/café was measured through a Likert scale of [1-5] and [1-7], respectively, with higher numbers representing a higher degree of irritation and likelihood to stay. Participants' WTP and WTA were measured using dollar values. For the segregated groups, we took the means of three individual values for each measure. The outliers that were three standard deviations away from their means were

dropped and not included in the analysis.

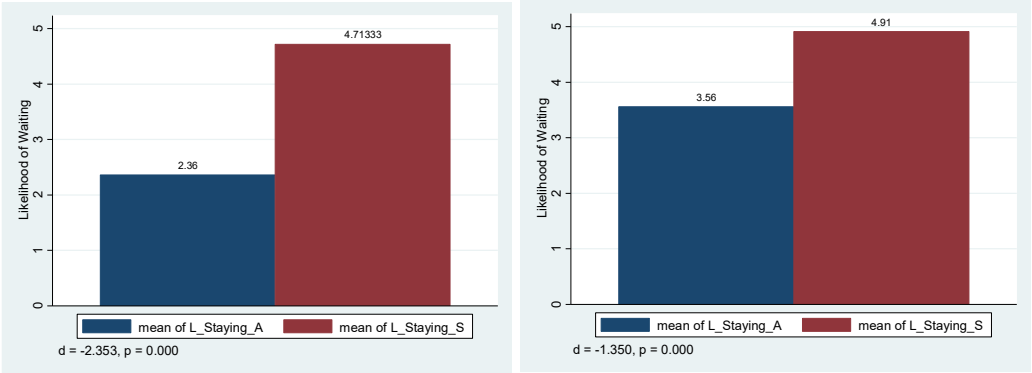
Results. The results shown in figures 21A and 21B indicated that when the waiting time was framed as aggregated (vs. segregated), participants felt more irritated *(restaurant:* $M_A = 3.250$, $M_s = 1.627$, $d = 1.623$, $p = 0.000$; *café:* $M_A = 1.960$, $M_s = 1.527$, $d = 0.433$, $p = 0.012$*).* These indicate that when waiting for a meal or a drink, people are more likely to feel annoyed when perceiving a 30-minute/15-minute waiting than when perceiving three 10-minute/5-minute waiting times.



21A: RESTAURANT SCENARIO 21B: CAFE SCENARIO

FIGURE 21
IRRITATION: AGGREGATED VS SEGREGATED WAITING TIME

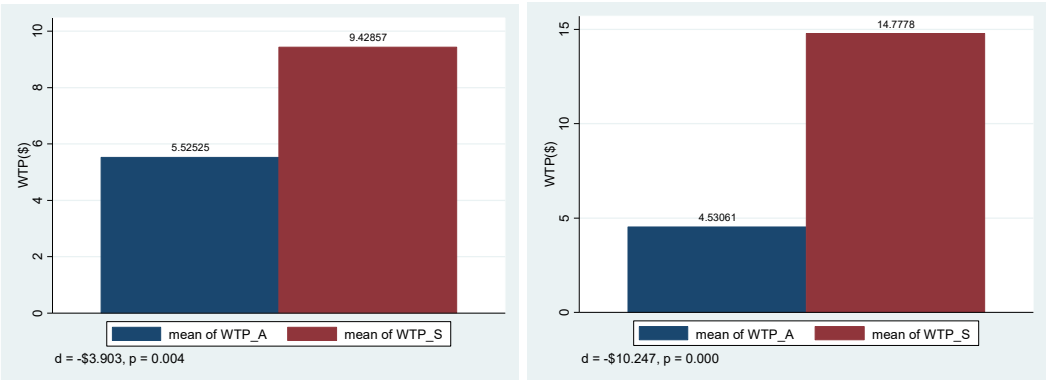
In addition, as shown in figures 22A and 22B, participants were more likely to stay and wait (*restaurant:* $M_A = 2.360$, $M_s = 4.713$, $d = -2.353$, $p = 0.000$; *café:* $M_A = 3.450$, $M_S = 4.910$, $d = -1.350$, $p = 0.000$*)* when they perceive the waiting time as separated, individual ones.



22A: RESTAURANT SCENARIO 22B: CAFE SCENARIO

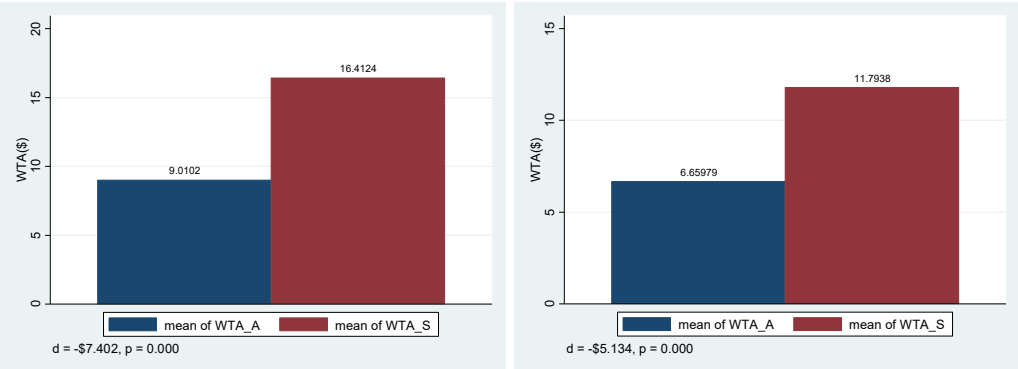
FIGURE 22
LEAVING: AGGREGATED VS SEGREGATED WAITING TIME

However, when concerning the fiscal value of time, shown in figures 23 and 24, unlike studies 1 and 2, participants had lower WTP *(restaurant:* M_A *= \$5.525,* M_s *= \$9.429, d = -\$3.903, p = 0.004; café:* M_A *= \$4.531,* M_s *= 14.778, d = -\$10.247, p = 0.000)* and lower WTA *(restaurant:* M_A *= \$9.010,* M_s *= \$16.412, d = -\$7.402, p = 0.000; café:* M_A *= \$6.660,* M_S *= \$11.794, d = -\$5.134, p = 0.000)* for aggregated (vs. segregated) time spent waiting. This result is inconsistent with the previous studies and unexpected.



23A: RESTAURANT SCENARIO 23B: CAFE SCENARIO

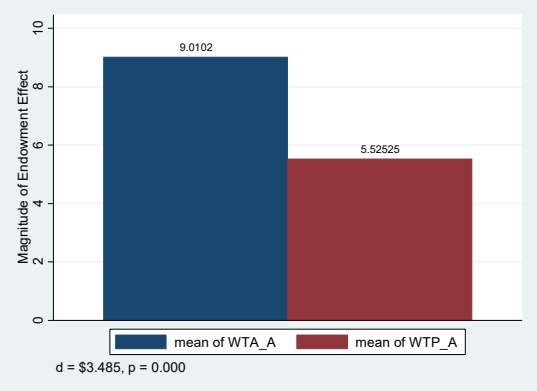
FIGURE 23
WTP: AGGREGATED VS SEGREGATED TIME-GAINS

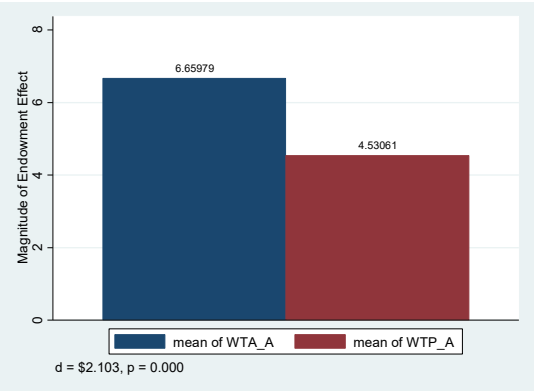


24A: RESTAURANT SCENARIO 24B: CAFE SCENARIO

FIGURE 24
WTA: AGGREGATED VS SEGREGATED TIME-LOSSES

While the sequence about the value of time reverses, the endowment effect still existing. The results shown in Figure 25A and 25B indicated that when the waiting time was aggregated, participants' WTA was higher than their WTP for the waiting time at a restaurant (WTA = $9.010, WTP = $5.525, d = $3.485, p = 0.000) and a café (WTA = $6.660, WTP = $4.531, d = $2.103, p = 0.000).

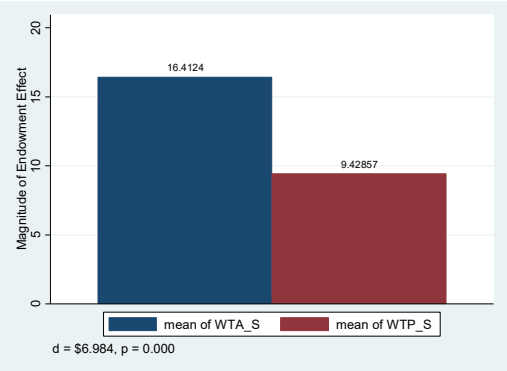


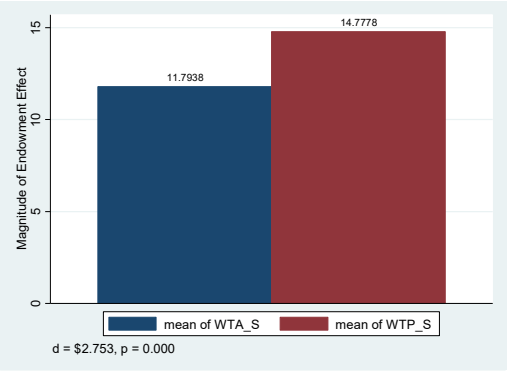


25A: RESTAURANT SCENARIO 25B: CAFE SCENARIO

FIGURE 25
ENDOWMENT EFFECT OF AGGREGATED TIME

However, when individual payments were required for each segregated time, the endowment effect held for the restaurant scenario (WTA = $16.412, WTP = $9.429, d = $6.984, p = 0.000) as shown in figure 26A, but reversed for the café scenario as shown in 26B (WTA = $11.794, WTP = $14.778, D = $2.753, P = 0.000).





26A: RESTAURANT SCENARIO 26B: CAFE SCENARIO

FIGURE 26
ENDOWMENT EFFECT OF SEGREGATED TIME

Discussion. Some of the results of study 4 were also consistent with our first three studies in which people showed a preference for segregated losses. However, when monetary transactions were included, the results were unexpected: participants had higher WTP and WTA for segregated time than for aggregated. Theoretically, the effects found in the previous three studies should have been reinforced in this study, as multiple payments may cause people to be willing to pay less for the segregated case. However, our results showed the opposite. Theoretically, the WTP for segregated time should be lower than when only one payment is required, as it required participants to experience the pain of paying more times. The concept of 'pain of paying' was first proposed by Prelec and Loewenstein in 1998, describing the interactions between the pleasure of consumption and the pain of paying. A central assumption of the model was that if the consumption has already been paid, it could be enjoyed as if it were free. However, when the payments were made prior to consumption instead of after, the associated pain would be buffered by thoughts of the benefits that the payments will finance (Prelec and Loewenstein 1998). In addition, as the degree of irritation and likelihood of leaving were lower in the segregated group, just like previous studies, we can eliminate the potential alternative that people's preferences between aggregated and segregated time are changed due to the separated payments.

Another potential reason could be that the amounts of time in study 4 were too small for the results to be generalizable. This could be a reason for the reversed endowment

effect found in study 4b. However, the total amount of time in the restaurant scenario was the same as in study 1, and the WTP and WTA found in study 4a were also opposite from the first three studies.

One of the possible explanations remaining was that the limitation of a hypothetical situation eliminates the effect of the pain of paying. People should be thinking of the other two payments when making individual decisions under incentive-compatible situations, or in real life, which was not the case in our hypothetical questions. Another potential reason is that when paying separately, people were less aware of the total amount of money they were paying, such that they unconsciously paid more in total. This is similar to the Pennies-a-Day strategy (Gourville 1998), where consumers are more willing to make small daily payments than to pay all at once. They tend to spend the same amount of money when the money is separated into small amounts, while they tend to save it when the money is considered as a whole, a large amount.

Conclusion

In this project, we found that when waiting in line at Disney, choosing a hotel based on transportation time, waiting for a meal or a drink at a restaurant or a café (i.e., four out of five comparisons about the degree of irritation), people feel more irritated about aggregated waiting time compared to segregated. Regarding the likelihood of choosing to wait, we found that when waiting at a lab, Disneyland, a restaurant, and a

café (i.e., four out of six comparisons about the likelihood of waiting), people are less likely to choose the option with aggregated (vs. segregated) waiting time. These results indicated the participants' preference for time-losses to be segregated, which opposes the ARMAs.

When it comes to the value of time, the results showed that people had higher WTP for eliminating aggregated waiting time at a lab study and eliminating transportation time when choosing a hotel, as well as higher WTA for adding aggregated waiting time at a lab study and Disneyland. We, therefore, conclude that four out of six comparisons support our hypothesis that people place more value on aggregated time compared to segregated time. However, when the payment for segregated time fragments requires separated payments for each individual wait, four out of four comparisons showed that participants placed a higher value on segregated time instead.

While the ARMAs were reversed, the endowment effect still existed for the value of time. When one payment was required for both aggregated and segregated groups, the participants had higher WTA than WTP for both aggregated and segregated time under the lab, Disney, and transportation scenarios, which means that six out of six comparisons supported our hypothesis that the value of time follows the endowment effect. However, when individual payments were required for each segregated time,

the endowment effect held for the restaurant scenario but reversed for the café scenario.

The results of these four studies indicate that when the objective is time, unlike the expected sequence of preferences of ARMAs, people prefer segregated time-losses and have higher WTA and WTP for the aggregated time-losses and time-gains unless separate transactions are required for the segregated time. So, we reject our first hypothesis while accepting the conclusion that people's valuing of time does not follow the ARMAs, but the reversed ones instead. On the other hand, we accept the second hypothesis, as this project showed that there exists an endowment effect of time.

General Discussion

The first three studies of this project showed that, along with the literature about endowment effect, there exists an endowment effect of time, while the results of this project also indicate that the value of time follows the reversed ARMAs. According to the Arithmetic Rules of Mental Accounting, people should prefer individual gains to be segregated and losses to be aggregated. So, the value of time is shown to be a new counterexample of the ARMAs in this project. There were some other counterexamples like the Pennies-a-Day strategy (Gourville 1998). It was demonstrated that consumers are more willing to make small daily payments than to

pay all at once. Regarding people's spending behaviors, people tend to spend the same amount of money when the money is separated into small amounts, while they tend to save it when the money is considered as a whole, a large amount. These types of inconsistent behaviors play a significant role in the effectiveness of monetary and fiscal policies.

There are also some other studies that have revealed experimental results in conflict with the ARMAs, like examining the temporal factors that may lead people's behaviors to diverge from the ARMAs (Thaler and Johnson 1990). In an experiment, 63% of participants think winning two lotteries two weeks apart is happier than getting both on the same day, which was consistent with the ARMAs that the segregated gains should be preferred. However, when asking about losing money for two times in the same day, 57% of participants think that would make the person more unhappy than two weeks apart. Our conclusion from Study 1 and 2 about the preference for losses' combination is consistent with this result that segregated losses, with temporal spacing, are preferred. This contradicts the ARMAs.

Some other experiments were replicating Thaler's experiments with different dollar amounts (e.g., Chang and Chen 2014). While previous counterexamples were mostly about money and focusing on the situations where the amounts of money were small, this project could contribute to the literature as a counterexample in a different

domain. In addition, previous literature about mental accounting and the endowment effect was mostly focused on money and material goods. Although time is also a finite and perishable resource (Jacoby, Szybillo, and Berning 1976; Leclerc, Schmitt, and Dube 1995; Okada and Hoch 2004), it cannot be stopped or stored like most of the resources. So, the value function of time should be different from other resources.

Imagine that we need 10 minutes, 20 minutes, and 30 minutes to complete activities A, B, and C respectively. Then, the set of doable things for 30 minutes is $\{A, A, A\} \& \{A, B\} \& \{C\}$, but the one for 3 of the 10 minutes is $\{A, A, A\}$. However, if we need 10 dollars, 20 dollars, and 30 dollars to buy products A, B, and C, respectively, then the set of buyable things for both 30 dollars and 3 of the 10 dollars is $\{A, A, A\} \& \{A, B\} \& \{C\}$. Correspondingly, the loss of 30 minutes would be worse than losing 3 of 10 minutes.

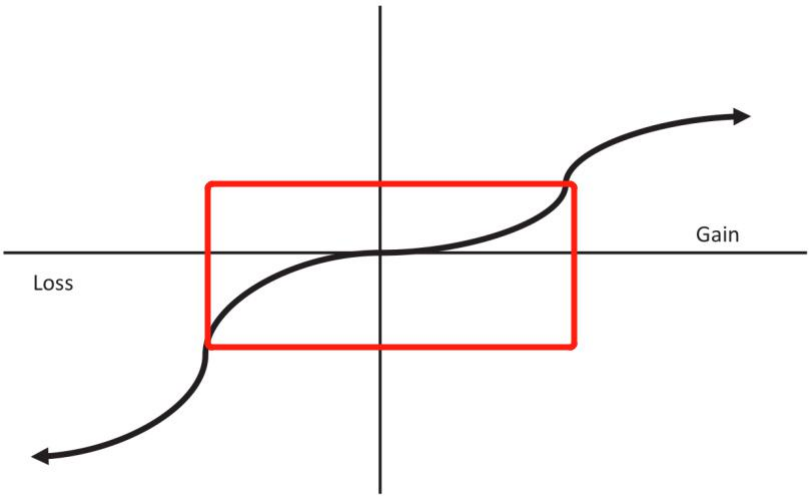


FIGURE 27
DOUBLE-KINKED VALUE FUNCTION

So, due to time’s nature as non-storable, the size of a block of time affects its value. As the size of a block of time grows, its value should increase as more time is better: we can perform a higher quantity of activities and have better opportunities for usage (Festjens and Janiszewski 2015). So, different from the value function, the value of time has an increasing marginal utility ($v''(x) > 0, x > 0; v''(x) < 0, x < 0$), which is an indicator of better opportunities for usage. However, the marginal utility of time should increase at a diminishing rate $v'''(x) < 0, x > 0; v'''(x) > 0, x < 0$, assuming a person typically schedules activities from most to least valuable.

So, once reaching a point where the amount of time is enough for everything imaginable to a person, the value of time may start to have a negative marginal utility and follow the same value function. This part was not covered in this project. Diminishing marginal utility is an indicator of resource abundance. According to Festjens and Janiszewski, the relative importance of the quality and quantity of the activities determines the width of the increasing and diminishing marginal utility zones in the value function of time. Initially, increasing the size of a block of time should address the opportunities-for-use issue, so that there should be increasing marginal utility (disutility) for moderate amounts of time. As the size of a block of time grows truly large, the value accrued from better quality activities should wane, and resource abundance should drive valuation. So, this project showed that the value of time should follow the double-kinked value function (figure 27) (Friedman and Savage 1948; Festjens and Janiszewski 2015) instead of the value function in figure 1

(Kahneman and Tversky 1979). This project contributes to the literature by examining these effects using time, an invisible thing, as the object, and connecting the literature about ARMAs to the value of time.

One of the limitations of this project is that all the studies were conducted through hypothetical scenarios. Although this would not affect the pattern between aggregated and segregated time-gains and time-losses, adding real monetary incentives could make the result closer to the reality in magnitude. In addition, more experiments with different amounts of time are needed to better explain the mechanism behind study 4 when people's behaviors reversed facing separated payments.

In general, this project, at the intersection of economics and consumer behavior, examined the ARMAs and endowment effect using resources besides money and found that the value of time follows the endowment effect but opposes the ARMAs. The implications of these effects could be used across various areas. Researchers can use the results to help design lab experiments and managing study time and compensation. Event holders can maximize their attendees' satisfaction by finding a balance when making trade-offs between hotels and ticket prices. Amusement park designers can make costumers more patient by simply framing the waiting time as segregated. Restaurant and cafe owners can separate the consumers' waiting time into different steps to increase satisfaction and prevent losing consumers due to the

waiting time. Beyond marketing and customer service, this project also has implications in domains other than time, such as money, friendship, love, improvement, and chance of success, among others. The awareness and willingness to embrace the segregated resources from different corners may have a significant effect on our mental health and happiness, as well as our quality of life.

REFERENCES

Brownstone, David, Arindam Ghosh, Thomas F. Golob, Camilla Kazimi, and Dirk Van Amelsforte (2003), “Drivers’ Willingness-to-Pay to Reduce Travel Time: Evidence from the San Diego I-15 Congestion Pricing Project,” *Transportation Research Part A: Policy and Practice*, 37(4), 373–87.

Chankon, Kim (1989), “Working Wives' Time-Saving Tendencies: Durable Ownership, Convenience Food Consumption, and Meal Purchases,” *Journal of Economic Psychology*, 10(3), 391–409.

C. Chang and P. Chen (2014), "When integration works better than segregation does in multiple-gain situations: The revised coding rules in mental accounting," Proceedings of PICMET '14 Conference: Portland International Center for Management of Engineering and Technology; Infrastructure and Service Integration, Kanazawa, 2014, pp. 542-554.

Darian, Jean C. and Judy Cohen (1995), “Segmenting by Consumer Time Shortage,” *Journal of Consumer Marketing*, 12(1), 32–44.

DeVoe, S. E., & Pfeffer, J. (2011), “Time is tight: How higher economic value of time increases feelings of time pressure,” Journal of Applied Psychology, 96(4), 665–676. https://doi.org/10.1037/a0022148

Eyal, Pee and Gamliel Eyal (2013), “Pace Yourself: Improving Time-Saving Judgments When Increasing Activity Speed,” *Judgment and Decision Making*, 8(2), 106–15.

Festjens, Anouk and Chris Janiszewski (2015), "The Value of Time," *Journal of Consumer Research*, 42, 178-195

Friedman, Milton and Leonard J. Savage (1948), "The Utility Analysis of Choices Involving Risk," *The Journal of Political Economy*, 56 (August), 279–304.

Gourville, J. (1998). "Pennies-a-Day: The Effect of Temporal Reframing on Transaction Evaluation," *Journal of Consumer Research*, 24(4), 395-403.

Harbaugh, William T., Kate Krause, and Lise Vesterlund (2001), "Are Adults Better Behaved Than Children? Age, Experience, and the Endowment Effect," *Economics Letters*, 70(2), 175–181.

Hoffman, Elizabeth and Matthew L. Spitzer (1993), "Willingness to Pay vs. Willingness to Accept: Legal and Economic Implications," *Washington University Law Quarterly*, 71, 59–114. ISSN 0043-0862.

Kahneman, D. and A Tversky (1979), "Prospect Theory: An Analysis of Decision under Risk," *Econometrica*, 47(2), 263–91.

Kahneman, Daniel, Jack L. Knetsch, and Richard H. Thaler (1990), "Experimental Tests of the Endowment Effect and the Coase Theorem," *Journal of Political Economy*, 98(6), 1325–48.

——— (1991), "Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias," *The Journal of Economic Perspectives*, 5(1), 193–206.

Kanngiesser, Patricia, Laurie R. Santos, Bruce M. Hood, and Josep Call (2011), "The

Limits of Endowment Effects in Great Apes (Pan paniscus, Pan troglodytes, Gorilla gorilla, Pongo pygmaeus),” *Journal of Comparative Psychology,* 125(4), 436–45.

Kirschenheiter, Michael and Nahum D. Melumad (2002), “Can "Big Bath" and Earnings Smoothing Co-Exist as Equilibrium Financial Reporting Strategies?" *Journal of Accounting Research*, 40(3), 761–96.

Koch, Timothy W. and Larry Wall (2000), “Bank Loan-Loss Accounting: A Review of Theoretical and Empirical Evidence,” *Economic Review*, 85(Q2), 1–20.

Lakshminaryanan, V., M. K. Chen, and L. R. Santos (2008), “Endowment Effect in Capuchin Monkeys,” *Philosophical Transactions of the Royal Society B: Biological Sciences*. B363, 3837–3844

Lim, S. (2006), “Do Investors Integrate Losses and Segregate Gains? Mental Accounting and Investor Trading Decisions,” *The Journal of Business*, 79(5), 2539–73.

List, John, A. (2002), “Preference Reversals of a Different Kind: The "More Is Less" Phenomenon,” *American Economic Review*, 92(5), 1636–43.

List, John A. (2012), “The Behavioralist Visits the Factory: Increasing Productivity Using Simple Framing Manipulations,” *Management Science*, 58(12), 2151–67.

Liu, Y, S Li, and Y Sun (2014), “Unpacking a Time Interval Lengthens its Perceived Temporal Distance,” *Frontiers in psychology*, 5, 1345.

doi:10.3389/fpsyg.2014.01345

Morewedge, Carey K. and Colleen E. Giblin (2015), "Explanations of the Endowment Effect: An Integrative Review," *Trends in Cognitive Sciences*, 19(6), 339–48.

Prelec, Drazen and George Loewenstein (1998), "The Red and the Black: Mental Accounting of Savings and Debt," *Marketing Science*, 17(1), 4–89

Rheault M. (2011), "Lack of money tops list of Americans' financial worries. Gallup Poll: Consumption Habits" www.gallup.com/poll/148625/lackmoney-tops-list-americans-financial-worries.aspx.

Shefrin, Hersh and Meir Statman (1993), "Behavioral Aspects of the Design and Marketing of Financial Products," *Financial Management*, 22, 123–34.

Svenson, Ola (2008), "Decisions Among Time Saving Options: When Intuition is Strong and Wrong," *Acta Psychologica*, 127(2), 501–509.

Thaler, Richard H. (1985), "Mental Accounting and Consumer Choice," *Marketing Science,* 4(3), 199-214

——— (1999), "Mental Accounting Matters," *Behavioral Decision Making*, 12(3), 183–206.

Thaler, Richard H. and Johnson, Eric J (1990), "Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice," *Management Science* 36(6), 643-660