Behavioral Economics versus Traditional Economics: Are They Very Different?

Chang, Kuo-Ping

Jinhe Center for Economic Research, Xi'an Jiaotong University

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Kuo-Ping Chang**

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** Jinhe Center for Economic Research, Xi'an Jiaotong University, Xianning West Road, 28#, Xi'an, Shaanxi Province, 710049, China; Department of Quantitative Finance, National Tsing Hua University, Kuang Fu Rd., Hsinchu 300, Taiwan. E-mail: kpchang@mx.nthu.edu.tw.

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ABSTRACT

Behavioral economics, notably developed by Daniel Kahneman, Amos Tversky and Richard Thaler, has found consistent and pervasive anomalies in common people's daily behaviors. This paper has employed the concepts in traditional economics (e.g., choice, relative price, and opportunity cost) to analyze the anomalies found in behavioral economics. The results show that quite a few anomalies, such as preference reversal, isolation effect and sunk cost fallacy, do not exist. This is not to say that people always make rational choices. The findings of the paper conclude, however, that common people may not be as irrational as behavioral economists have suggested (in some situations, common people may act more like a rational economist).

Keywords: Choice, sunk cost fallacy, relative price ratio (rate of return), prospect theory, endowment effect.

JEL Classification: D9, D11.

1. Introduction

The seminal works by Daniel Kahneman, Amos Tversky and Richard Thaler has inspired many researches in behavioral economics. Behavioral economics incorporates the concepts and methods in psychology science into traditional economics. It has found consistent and pervasive anomalies in common people's behaviors. These anomalies, such as preference reversals, isolation effect, sunk cost fallacy, and endowment effect, challenge the rational behavior assumption in traditional economics.

This paper has employed the concepts in traditional economics (e.g., choice, relative price, and opportunity cost) to analyze the anomalies found in behavioral economics. The results show that quite a few anomalies, such as preference reversal, isolation effect and sunk cost fallacy, do not exist. This is not to say that people always make rational choices. The findings of the paper conclude, however, that common people may not be as irrational as behavioral economists have suggested.

The remainder of this paper is organized as follows. Section 2 discusses preference reversal and isolation effect within the framework of prospect theory. Section 3 shows the fallacies of sunk cost fallacy. The application of the concept of opportunity cost is introduced in Section 4. Section 5 applies the concept of relative price ratio (rate of return) to analyze the anomalies. Section 6 discusses the concepts of prospect theory. Concluding remarks appear in Section 7.

2. Have a Choice versus Have No Choice

Kahneman and Tversky (1979, 1984), Tversky and Kahneman (1981, 1986) and Kahneman (2011) have used the following experiment to show that people often disregard components that alternatives share, and focus on the components that distinguish them:

> Example 1. Consider the following two-stage game. In the first stage, there is a 75% chance to end the game without winning anything, and a 25% chance to move into the second stage. If you reach the second stage, you have a choice between:
>
> (A) 80% chance to win $4000 and 20% chance to win nothing;
>
> (B) $3000 with certainty.
>
> Your choice must be made before the game starts, i.e., before the outcome of the first stage is known.

Kahneman and Tversky (1979, p. 271) argue that "in this game, one has a choice between 0.25 × 0.80

= 0.20 chance to win \$4000, and a 0.25 × 1.0 = 0.25 chance to win \$3000", and hence, in terms of probabilities and outcomes this two-stage game (Example 1) is identical to the following game:

Example 2. People are asked to choose from:

(A) 20% chance to win \$4000 and 80% chance to win nothing;

(B) 25% chance to win \$3000 and 75% chance to win nothing.

Kahneman et al. find that in Example 1, most subjects chose (B), but in Example 2, most subjects chose (A). They refer this phenomenon as the *isolation effect*, and claim that "evidently, people ignored the first stage of the game, whose outcomes are shared by both prospects" (p. 271), and "the reversal of preferences due to the dependency among events is particular significant because it violates the basic supposition of a decision-theoretical analysis, that choices between prospects are determined solely by the probabilities of final states" (p. 272).

Unfortunately, Kahneman et al.'s experiment is erroneous. Their findings of isolation effect and reversal of preferences do not exist. Note that it is meaningless to consider the first stage of the game and calculate the probabilities: 0.25 × 0.80 = 0.20 and 0.25 × 1.0 = 0.25 because people have no choice in the first stage. People will only consider: which choice I should take if I enter the second stage (i.e., if I "survive"). The magnitude of the probabilities of the first stage is irrelevant to people's decision-making, i.e., the first stage of Example 1 is redundant. Example 1 should be written as:

Example 3. You have a choice between:

(A) 80% chance to win \$4000 and 20% chance to win nothing;

(B) \$3000 with certainty.

Example 3 (Example 1) and Example 2 are two different games. The following is another example. Suppose you apply for a job in a firm, and you have a 0.25 chance to succeed. Once you succeed in entering the firm, you have a choice for your salary between: (A) \$4000 with a probability of 0.80 and \$0 with a probability of 0.20; (B) \$3000 for sure. Note that in this game, you only care which salary structure you should choose if you "survive", i.e., if you are hired by the firm. The probability of 0.25, set by the firm, is irrelevant to your making choice.[1]

[1] Tversky and Kahneman's (1986, p. S268-S269) medical treatment of tumor experiment (Case 3) is exactly the same as Example 1 except that the subjects are not required to make a choice before the game starts. Tversky et al. argue that people made mistakes by not using the probabilities: 0.25 × 0.80 = 0.20 and 0.25 × 1.0 = 0.25 and claim that it is 'pseudocertainty effect'. This is wrong since the probability 0.25 of the testing result that the tumor is treatable in the first stage is not up to the subjects to decide. If the tumor is not treatable, i.e., the subject cannot survive, it will be meaningless to ask which choice

3. Fallacies of the Sunk Cost Fallacy

Thaler (2018) uses the following example to explain the sunk cost fallacy in people's behavior:[2]

> Example 4. My friend Jeffrey and I were given two tickets to a professional basketball game in Buffalo, normally a 75-minute drive from Rochester. On the day of the game there was a snowstorm and we sensibly decided to skip the game. But Jeffrey, who is not an economist, remarked, "If we had paid full price for those tickets we would have gone!"

Thaler argues that "as an observation about human behavior he was right, but according to economic theory sunk costs do not matter. Why is going to the game more attractive if we have higher sunk costs?" (p.1266). However, Thaler's arguments are not correct. People have limited budget. Suppose that a basketball game ticket price is $40. A good meal for a person also costs $40. The cost (disutility) of driving through the blizzard of each person is: $\mathrm{c(driving\ \ to\ \ game)}$. There are two possible scenarios in their consumption bundles:

Case 1: Instead of purchasing a ticket, the person purchases a good meal and receives a free ticket.

Case 2: Instead of spending $40 on a good meal, the person purchases a ticket.

In Case 1, the person could afford a basketball game ticket but did not purchase it. This implies that the utility of a basketball game (under not purchase) is less than the utility of a good meal, i.e., $\mathrm{u^{not\_purchase}(basketball\ \ game) < u(good\ \ meal)}$. In Case 2, the person purchased a basketball game ticket and did not purchase a good meal. This implies that the utility of a basketball game (under purchase) is greater than the utility of a good meal, i.e., $\mathrm{u^{purchase}(basketball\ \ game) > u(good\ \ meal)}$. Since $\mathrm{u^{not\_purchase}(basketball\ \ game) < u(good\ \ meal) < u^{purchase}(basketball\ \ game)}$, we have:

$$\mathrm{u^{not\_purchase}(basketball\ \ game) - c(driving\ \ to\ \ game)}$$
$$< \mathrm{u^{purchase}(basketball\ \ game) - c(driving\ \ to\ \ game)}$$

It implies that $\mathrm{[u^{not\_purchase}(basketball\ \ game) - c(driving\ \ to\ \ game)]}$ is more likely to be negative than $\mathrm{[u^{purchase}(basketball\ \ game) - c(driving\ \ to\ \ game)]}$. That is, comparing with buying a ticket, not buying a ticket but receiving it as a gift will be less likely to drive through a snowstorm to watch the game. In this example, the so-called sunk cost plays no role at all (i.e., they still have the choice to go or

(treatment) the subject will choose in the second stage.

[2] See also Thaler (1980).

not to go to the game). Jeffrey acts more like an economist.

Arkes and Blumer's (1985) experiment of theater ticket prices finds that after randomly assigning season tickets to theater goers, those paying more for their tickets attended significantly more plays within the first half of the season. They claim that this is because "these groups have different sunk costs" (p. 128), i.e., "I have spent so much money and I will use it more frequently". But spend less money on the season ticket also means that you have more extra money and time to do other activities which can produce utilities to compensate the loss of less theater going.[3] Ashraf, Berry and Shapiro (2010) employ a disinfectant product use experiment in Zambia to show that higher prices can increase use by a screening effect (targeting distribution to high-use households) but not by sunk cost effect (stimulating use psychologically). Just, and Wansink's (2011) experiment of an all-you-can-eat pizza restaurant finds that **"**a 50% discount on the price of the meal led customers to consume 27.9% less pizza (2.95 versus 4.09 pieces). A second analysis indicated that individual taste ratings of this pizza tended to be inversely related to how much is consumed. One possible interpretation of these two findings is that individuals in a flat-rate (or fixed-price) context may consume the amount that enables them to get their money's worth rather than consuming until their marginal utility of consumption is 0" (p. 193). People have limited budget (income). Higher price for disinfectant product means that you need to reduce your consumption of other goods in your consumption bundle (i.e., reduce utilities), which implies that you will increase the use of the product to gain more utilities to compensate the loss of the utilities. Lower price at the all-you-can-eat pizza restaurant means that you have more extra money to do other activities (e.g., go swimming) or buy other goods (e.g., an ice cream cone), which can bring utilities to compensate the loss of the utilities by consuming less pizza.

Arkes et al. (1985, p. 124) define the sunk cost effect as "a greater tendency to continue an endeavor once an investment in money, effort, or time has been made. The prior investment, which is motivating the present decision to continue, does so despite the fact that it objectively should not influence the decision". Thaler (1980, p. 47) defines the sunk cost effect as "paying for the right to use a good or service will increase the rate at which the good will be utilized, *ceteris paribus*". However, increasing use of a good or

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[3] For the second half of the season, Arkes et al. find that all the groups attend about the same number of plays. This may be due to that people in the second half of the season had new choices which can produce higher net utilities rather than 'diminishing sunk cost effect'. Gourville and Dilip Soman's (1998) experiment of gym memberships and attendance also finds that the price paid for an item has a diminishing effect on consumption behavior as time goes on, and there was a substantial spike in attendance following payment.

escalation of commitment to a failing course of action does not constitute a sunk cost effect (fallacy). A sunk cost fallacy occurs only when you make a choice without considering all other alternatives. For example, having the thinking: "My investment in this stock already lost 50,000 dollars. If I sell the stock now, I will never have the chance to recover my loss " without thinking about whether it is better to move the money from the stock to other alternatives.[4] Brockner, Shaw and Rubin (1979) use the example of waiting for a bus to show a sunk cost situation: after a very long wait, people still decide not to take a cab, thereby nullifying all the time they have spent waiting for the bus (time already spent waiting is a sunk cost). Northcraft and Wolf (1984) argue that continued investment in many of them does not necessarily represent an economically irrational behavior (e.g., continued waiting for the bus will increase the probability that one's waiting behavior will be rewarded). Note that even if continued waiting for the bus will not increase the probability of the arriving of the bus, continued waiting may still be a rational behavior: As long as people's evaluation about which choice (waiting for the bus or taking a cab) is better does not change after a very long wait, continued waiting is rational.

4. Cost is Opportunity Cost

An opportunity cost is "the evaluation placed on the most highly valued of the rejected alternatives or opportunities" (Buchanan 2008). Buchanan (1969, p. 43) emphasizes that "cost is based on anticipations; it is necessarily a forward-looking or *exante* concept".[5] Thirlby (1946) argues that "cost occurs only when decisions are made, that is, in planning stages" (p. 259). Thirlby clarifies the distinction between decision, budget, and accounting levels of calculation (Buchanan, 1969, p.32):

(1) Cost is relevant to decision, and it must reflect the value of foregone alternatives.
(2) A budget reflects the prospective or anticipated revenue and outlay sides of a decision that *has been made*. It is erroneous to consider such prospective outlays as appear in a budget as costs. The budget must, however, also be distinguished from the account, which measures realized revenues and outlays that result from a particular course of action.

In summary, opportunity cost is *ex-ante*, implying that you still have the opportunity to make a choice.

Shafir and Thaler (1998) and Thaler (1999, p.191) has used an experiment of futures market of wine

4 See Appendix for a real story of the sunk cost fallacy.

5 Buchanan (1969, p.28) introduces Ronald Coase's definition of opportunity cost as: "Any profit opportunity that is within the realm of possibility but which is rejected becomes a cost of undertaking the preferred course of action".

to examine people's perceptions about opportunity cost:

> Example 5. Suppose you bought a case of good Bordeaux in the futures market for \$20 a bottle. The wine now sells at auction for about \$75. You have decided to drink a bottle. Which of the following best captures your feeling of the cost to you of drinking the bottle? (The percentage of people choosing each option is shown in brackets.)
>
> Answers: (1) \$0 [30%]; (2) \$20 [18%]; (3) \$20 plus interest [7%]; (4) \$75 [20%]; (5) -\$55 [25%].

Thaler et al. argue that the correct answer according to economic theory is \$75, since the opportunity cost of drinking the wine is selling it at that price (many economists who completed the survey also agreed). But in this example, since a choice has already been made to drink the bottle, opportunity cost doesn't exist. Thaler et al. also asked the subjects how it would feel if they had dropped and broken the bottle. A majority said they felt that dropping the bottle costs them \$75, what they could get for selling it. In this case, again, opportunity cost is irrelevant since people cannot make any choice on a broken bottle of wine.

Ferraro and Taylor (2005) and Frank and Bernanke (2001) provide the following survey of estimating opportunity cost:

> Example 6. You won a free ticket to see an Eric Clapton concert (which has no resale value). Bob Dylan is performing on the same night and is your next-best alternative activity. Tickets to see Dylan cost \$40. On any given day, you would be willing to pay up to \$50 to see Dylan. Assume there are no other costs of seeing either performer. Based on this information, what is the opportunity cost of seeing Eric Clapton? (The percentage of people choosing each option is shown in brackets.)
>
> Answers: (A) \$0 [25.1%]; (B) \$10 [21.6%]; (C) \$40 [25.6%]; (D) \$50 [27.6%].

Ferraro et al. argue that \$10 is the correct answer because: "When you go to the Clapton concert, you forgo the \$50 of benefits you would have received from going to the Dylan concert. You also forgo the \$40 of costs that you would have incurred by going to the Dylan concert. An avoided benefit is a cost, and an avoided cost is a benefit. Thus, the opportunity cost of seeing Clapton, the value you forgo by not going to the Dylan concert, is \$10 – i.e., the net benefit forgone" (p. 3).

However, Ferraro et al.'s arguments are not correct. There are two possible scenarios:

Case 1: You do not have \$40. This implies that you have no choice, i.e., you can only go to the Clapton concert, and hence, opportunity cost does not exist.

Case 2: You have \$40. This means that if you choose to go to the Clapton concert, you can spend that \$40 on other goods which provides utilities: $u(\$40)$. Thus, the opportunity cost of seeing Clapton is:

$u(Dylan's\ concert) - u(\$40)$, and the opportunity cost of seeing Dylan is: $u(Clapton's\ concert) + u(\$40)$.

5. Relative Price Ratio (or Rate of Return) Matters

In traditional economics, suppose that you have initial wealth $w = \$10{,}000$. When w increases to \$12,000, *the relative wealth (price) ratio* is: $12{,}000/10{,}000 = 1.2/1$, which means you exchange 1 unit of wealth for 1.2 units of wealth or earn 20% rate of return. When \$12,000 increases to \$14,000, $14{,}000/12{,}000 = 1.167/1$ means that you exchange 1 unit of wealth for 1.167 units of wealth or earn 16.7% rate of return. This indicates that *a change of wealth* can result in diminishing marginal utility of wealth.[6] Note that if for example, the initial wealth is $w = \$12{,}000$, the aggravation that people experience in losing \$2,000 will be greater than the pleasure associated with gaining \$2,000, i.e., losses loom larger than gains. This is because $1.2/1 > 1.167/1$ means: (1) to increase wealth from \$12,000 to \$14,000 you need to earn only 16.7% rate of return; but (2) once your wealth drops from \$12,000 to \$10,000, you need to earn 20% rate of return to go back to your original position.[7]

Kahneman and Tversky (1979, p.278) (and Thaler, 1980) argue that:

> Example 7. The difference in value between a gain of \$100 and a gain of \$200 appears to be greater than the difference between a gain of \$1,100 and a gain of \$1,200. Similarly, the difference between a loss of \$100 and a loss of \$200 appears greater than the difference between a loss of \$1,100 and a loss of \$1,200, unless the larger loss is intolerable.[8]

This is *a change of change*. Denote the initial wealth as w. The relative price ratio of increment \$200 to increment \$100 is: (1) $2/1 = 200/100 = [(w + 200) - w]/[(w + 100) - w]$; and the relative price

[6] Suppose that the increment of wealth is \$200,000 and initial wealth is \$1,000,000. Although the relative wealth ratios show: $1{,}200{,}000/1{,}000{,}000 = 1.2/1 > 1{,}400{,}000/1{,}200{,}000 = 1.167/1$, people may feel equally happy because relative to people's income, \$200,000 is a huge amount of money which can be used to buy many pricy commodities.

[7] This result refutes Kahneman and Tversky's (1979) claim that "… utility theory. In that theory, for example, the same utility is assigned to a wealth of \$100,000, regardless of whether it was reached from a prior wealth of \$95,000 or \$105,000. Consequently, the choice between a total wealth of \$100,000 and even chances to own \$95,000 or \$105,000 should be independent of whether one currently owns the smaller or the larger of these two amounts" (p. 273).

[8] Thaler (1980, p. 50) argues that this is the Weber-Frechner law: the just noticeable difference in any stimulus is proportional to the stimulus. However, this law is an application of relative price ratio in decision-making.

ratio of increment \$1,200 to increment \$1,100 is: (2) $1.091/1 = 1{,}200/1{,}100 = [(w + 1{,}200) - w]/[(w + 1{,}100) - w]$. This means: (1) when a gain of \$100 becomes a gain of \$200, your one unit of gain becomes 2 units of gain, i.e., your rate of return is 100%; (2) when a gain of \$1,100 becomes a gain of \$1,200, your one unit of gain becomes only 1.091 units of gain, i.e., your rate of return is only 9.1%. For the cases of a loss of \$100 and a loss of \$200, the relative price ratios are still the same: (1) $2/1 = -200/-100 = [(w - 200) - w]/[(w - 100) - w]$; and (2) $1.091/1 = -1{,}200/-1{,}100 = [(w - 1{,}200) - w]/[(w - 1{,}100) - w]$. That is, (1) when a loss of \$100 becomes a loss of \$200, your one unit of loss becomes 2 units of loss, i.e., your rate of return is -100%; (2) when a loss of \$1,100 becomes a loss of \$1,200, your one unit of loss becomes 1.091 units of loss, i.e., your rate of return is -9.1%. These results show that people feel happier when gaining \$100 becomes gaining \$200 than when gaining \$1,100 becomes \$1,200. People feel more painful when losing \$100 becomes losing \$200 than when losing \$1,100 becomes losing \$1,200.

> Example 8. (Tversky and Kahneman, 1981, p. 459) Imagine that you are about to purchase a jacket for (\$125)[\$15] and a calculator for (\$15)[\$125]. The calculator salesman informs you that the calculator you wish to buy is on sale for (\$10)[\$120] at the other branch of the store, located 20 minutes drive away. Would you make the trip to the other store?[9]

Thaler (1999) argues that "when two versions of this problem are given (one with the figures in parentheses, the other with the figures in brackets), most people say that they will travel to save the \$5 when the item costs \$15 but not when it costs \$125. If people were using a minimal account frame they would be just asking themselves whether they are willing to drive 20 minutes to save \$5, and would give the same answer in either version" (p. 186). However, Tversky et al.'s and Thaler's arguments are not correct because their minimal account frame ignores the relative price information. That is, the question is not "Are you willing to drive 20 minutes to save \$5?", but "Are you willing to drive 20 minutes to save \$5 so that you don't need to:

Case 1. Pay $1.5 (= 15/10)$ times the price (and let the seller earn 50% more rate of return from you)? or

Case 2. Pay $1.042 (= 125/120)$ times the price (and let the seller earn 4.2% more rate of return from you)?"

While considering relative price ratios, most people will choose Case 1.

Zhang and Sussman (2018, p. 10) (and Sussman and Shafir , 2012) argue that "all else equal, a person's

[9] See also Thaler (1980, p. 50).

view of her personal wealth should be driven by her net worth—the difference between her assets and debts. Holding constant her overall worth, the level of assets and debt should not matter". They find:

> Example 9. Financial profiles with higher levels of assets and debt are viewed as wealthier when overall net worth is negative (e.g., $50,000 in assets and $100,000 in debt is preferred to $20,000 in assets and $70,000 in debt) while profiles with lower levels of assets and debt are viewed as wealthier when overall net worth is positive (e.g., $70,000 in assets and $20,000 in debt is preferred to $100,000 in assets and $50,000 in debt).

This is another example of relative price ratio where people pay attention not only to net worth:

Case 1. Negative net wealth:

$\text{asset/debt} = 50{,}000/100{,}000 = 0.5/1 > 20{,}000/70{,}000 = 0.286/1.$ This means that for $50,000 in assets and $100,000 in debt, if default, every one dollar of debt can get 0.5 dollars back; and for $20,000 in assets and $70,000 in debt, if default, every one dollar of debt can only get 0.286 dollars back. Thus, higher levels of assets and debt are viewed as wealthier.

Case 2. Positive net wealth:

$\text{asset/debt} = 100{,}000/50{,}000 = 2/1 < 70{,}000/20{,}000 = 3.5/1.$ This means that for $100,000 in assets and $50,000 in debt, every one dollar of debt is covered (protected) by 2 dollars; and for $70,000 in assets and $20,000 in debt, every one dollar of debt is covered (protected) by 3.5 dollars. Thus, lower levels of assets and debt are viewed as wealthier.

6. Some Applications:

Prospect Theory

Kahneman and Tversky's (1979, p. 268) prospect theory argues that people show risk aversion in the domain of gains and risk seeking in the domain of losses. Kahneman et al. use the following two experiments to prove their arguments:

Example 10. People are asked to choose from:

(A) 80% chance to win $4,000 and 20% chance to win nothing; or

(B) gain $3,000 for sure.

Example 11. People are asked to choose from:

(A) 80% chance to lose $4,000 and 20% chance to lose nothing; or

(B) lose \$3,000 for sure.

Kahneman et al. find that in Example 10, most subjects (80%) chose (B), but in Example 11, most subjects (92%) chose (A). They argue that with the some reference point, a person will show risk aversion in the domain of gains (i.e., in Example 10) and risk seeking in the domain of losses (i.e., in Example 11), and hence, "the value function for changes of wealth is normally concave above the reference point and often convex below it" (p. 278).

However, it may not be: "people will show risk aversion in the domain of gains". In Example 10, two points regarding the increment $(\$1000 = \$4{,}000 - \$3{,}000)$ of increment (\$3,000) should be noted:

(1) The difference between a gain of 0 and a gain of \$3,000 is greater than the difference between a gain of \$3,000 and a gain of \$4,000. This is because $3{,}000/1 > 4{,}000/3{,}000 = 1.333/1$ implies that 33.3% rate of return of \$3,000 becoming \$4,000 is much smaller than 300,000% rate of return of \$1 becoming \$3,000.

(2) People have a 80% chance to increase the increment from \$3,000 to \$4,000 but also have a 20% chance to lose the original increment \$3,000. 3,000 dollars is a large amount of money which may afford a couple a four-day tour of Paris.[10]

Based on these two points, people will be very reluctant to choose the risky choice (A).

For Example 11, another two points should be noted:

(1) The difference between a loss of 0 and a loss of \$3,000 is greater than the difference between a loss of \$3,000 and a loss of \$4,000 because $3{,}000/1 > 4{,}000/3{,}000 = 1.333/1$ implies that 33.3% rate of return of \$3,000 loss becoming \$4,000 loss is much smaller than 300,000% rate of return of \$1 loss becoming \$3,000 loss.

(2) People have a 20% chance to win back the original lost \$3,000 but also have a 80% chance to increase the loss from \$3,000 to \$4,000. Losing \$3,000 in your budget could be very painful because you have to determine which commodities you should sacrifice.

Based on the above two points, people will be more willing to choose the risky choice (A).

The following experiment is used to examine whether a small amount (relative to people's budget) of gain and loss affects people's decisions:[11]

Example 12. People are asked to choose from:

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[10] In Kahneman et al. (1979), 3,000 is the median net monthly income for a family in Israel currency (p. 264).

[11] This experiment was done at Xi'an Jiao Tong University in 2018. The number of the subjects (most are undergraduates) is 158. CNY3,000 is about the median monthly income of a new college graduate. CNY3 is the price of a lottery. The author wishes to thank Professor Qin, Botao for his help in designing this experiment.

(A) 80% chance to win CNY4,000 and 20% chance to win nothing; [21%]

(B) gain CNY3,000 for sure. [67%]

(C) indifferent between (A) and (B). [12%]

Example 13. People are asked to choose from:

(A) 80% chance to lose CNY4,000 and 20% chance to lose nothing; [61%]

(B) lose CNY3,000 for sure. [26%]

(C) indifferent between (A) and (B). [13%]

Example 14. People are asked to choose from:

(A) 80% chance to win CNY4 and 20% chance to win nothing; [58%]

(B) gain CNY3 for sure. [28%]

(C) indifferent between (A) and (B). [14%]

Example 15. People are asked to choose from:

(A) 80% chance to lose CNY4 and 20% chance to lose nothing; [55%]

(B) lose CNY3 for sure. [23%]

(C) indifferent between (A) and (B). [22%]

It shows that when the amount of the outcomes is big (i.e., Examples 12 and 13), the results are similar to Kahneman et al.'s (1979)(i.e., Examples 10 and 11). But when the amount of the outcomes is very small (i.e., Examples 14 and 15), most subjects chose the risky choice (A). This indicates that with small outcomes (which equals the price of a lottery), people will take the games as an entertainment (play for fun) because these outcomes (gains or losses) will not affect people's consumption levels.[12]

Note that if the gain and loss of a game are small relative to people's budgets, people usually will not be interested in it. Friedman and Savage (1948, p. 279) argue that "an individual who buys fire insurance on a house he owns … is choosing certainty in preference to uncertainty", and "an individual who buys a lottery ticket … is choosing uncertainty in preference to certainty". Their arguments are not accurate. An individual could possibly buy both fire insurance and lottery ticket because the insurance premium and lottery ticket price are small relative to her budget. Also, buying a lottery ticket can provide her a chance/choice (even if it's very small) to become a millionaire, and buying a fire insurance can give her a

[12] Thlaer and Johnson's (1990) experiment find that a large majority of subjects prefer temporal separation of gains to have them occur together. They also find that most subjects prefer temporal separation of losses to have them occur together. This may due to the fact that large sum of loss could seriously affect people's consumption levels (life style). People will prefer to amortize the loss to separate periods (as companies always do to avoid a big drop in their stock prices).

chance/choice to avoid the possibility of losing a big fortune which will affect her consumption levels.

Kahneman and Tversky's (1979, p. 281) experiment of buying lotteries and insurance finds that people prefer a 0.1% chance of $5,000 to a certain gain of $5, but also prefer a certain loss of $5 to a 0.1% chance of losing $5,000. Tversky and Kahneman (1992) propose the probability weighting function to explain this result. The weighting function overweights low objective probabilities and underweights high objective probabilities. In addition to use a specific function to consider overweighting and underweighting, we can also use the Gordan (Arbitrage) theory to estimate these probabilities.[13] Chang (2018) has shown that the probabilities (p and $1-p$) of the following equation of the Gordan theory are the real world subjective probabilities:

$$S_{ce} = \frac{1}{1+r}\left[p \cdot S_1 + (1-p) \cdot S_2\right] \ , \tag{1}$$

where S_{ce} is the certainty equivalent, S_1 is the value at state 1, S_2 is the value at state 2, and r is the risk-free interest rate. In Gonzalez and Wu's study (1999), subjects state an average certainty equivalent of $10 for a 0.05 chance of $100, and $63 for a 0.9 chance of $100. From eq. (1) where the risk-free interest is 0, we can estimate: $10 = p \times 100 + (1-p) \times 0$ and $\mathrm{p} = 0.10$, $63 = p' \times 100 + (1-p') \times 0$ and $\mathrm{p}' = 0.63$. That is, people's subjective probabilities overweights low objective probabilities and underweights high objective probabilities.

Endowment Effect

Suppose that you just bought a pen for $10. How much are you willing to sell it for? The answer should be more than $10. This is because when you decided to use $10 to buy the pen, you must prefer the pen to $10, i.e., $\mathrm{u(pen)} > \mathrm{u(\$10)}$. Hence, when you sell it, you will ask more than 10 dollars, i.e., willing to accept (WTA) is greater than willing to pay (WTP).[14] This result has nothing to do with the psychological aspect of endowment effect, which emphasizes that once you own a thing, you may feel

[13] Chang (2015, p. 41) has shown the Gordan theory as:

Let A be an $m \times n$ matrix. Then, exactly one of the following systems has a solution:

System 1: $Ax > 0$ for some $x \in R^n$

System 2: $A^T p = 0$ for some $p \in R^m,\ p \geq 0,\ e^T p = 1$ where $e = \begin{bmatrix} 1 \\ 1 \\ \cdot \\ \cdot \\ \cdot \\ 1 \end{bmatrix}$.

[14] Microeconomics states that if a good is a normal good and hence a non-Giffen good, then WTA is greater than WTP. When there is no income effect, WTA and WTP are equal.

attached to it.

Many experiments have shown that WTA is much greater than WTP. Thaler's (1980) rare fatal disease experiment find that when subjects are told that they had been exposed to a fatal disease and that they now face a 0.1% chance of painless death within two weeks. They must decide how much they would be willing to pay for a vaccine, to be purchased immediately. The same subjects were also asked for the compensation they would demand to participate in a medical experiment in which they face a 0.1% chance of a quick and painless death. The result shows that for most subjects the two prices differed by more than an order of magnitude. Hanemann (1991) argues that large WTA-WTP disparity can also arise from low substitutability between the environmental good and each of the private goods in the individual's utility function. However, large gap between WTA and WTP could be due to that the good you plan to give up (to sell) interconnects with many other goods in your original consumption bundle (e.g., take the risk of a quick death versus a plan to get marry or a trip to Disneyland with your family; no more beautiful scenery outside your house versus entertaining friends in your house).

Kahneman, Knetsch, and Thaler's (1990) experiment is to give half of subjects mugs and another half none, and then ask them at what price they are willing to sell (WTA) and at what price they are willing to buy (WTP). They find that median selling prices are about twice median buying prices. Note that this may be because once a mug is given to a subject, it enters into the subject's consumption bundle and the subject has a plan for it (e.g., put it on a shelf or give it to her mom as a souvenir). When an individual has a high expectation for getting a good (or a job), if she fails, it will greatly disappoint her because she might already have a plan for it. Cohen and Knetsch (1992) find that in tort law judges make the distinction between loss by way of expenditure and failure to make gain, e.g., the plaintiff was able to recover wages paid to employees which were considered "positive outlays" but could not recover lost profits which were merely "negative losses consisting of a mere deprivation of an opportunity to earn an income".

Knetsch and Sinden's (1984) endowment effect experiment find that after subjects were selected at random to receive either $3 or a lottery ticket, of those initially given a lottery ticket 82 percent chose to keep it, and 62 percent of those given the $3 would not give it up. Samuelson and Zeckhauser's (1988) experiment assumes: an individual inherited a large sum of money (or a portfolio of cash and securities) from her great-uncle. She is considering different portfolios. Samuelson et al. find that an alternative became significantly more popular when it was designated as the status quo. These results show that if people do not have new information or different expectations about the future, they will maintain the status quo (i.e., if it's not broke, don't fix it).

Procrastination

Procrastination is defined as “when present costs are unduly salient in comparison with future costs, leading individuals to postpone tasks until tomorrow without foreseeing that when tomorrow comes, the required action will be delayed again.” (Arkerlof, 1991, p. 1). The reason why people postpone their works, i.e., treasure present more than tomorrow, is that they can have more choices to make a better arrangement for today and tomorrow tasks, although procrastination sometimes could lead to serious losses. For example, the poverty of the elderly may be due to inadequate saving for retirement. But have not saved enough at young age may not be an irrational decision. After all, no one is sure how long she/he can live. Also, even if spend a bit more money in this month, people still have a chance to earn those money back in the future.[15]

Camerer, Babcock, Loewenstein and Thaler’s (1997) survey of cab drivers finds that the number of hours that a driver works on a given day is strongly inversely related to his average hourly wage on that day, i.e., drivers establish a target earnings level per day, and they will tend to quit earlier on good days. This behavior may not be irrational since keep on working for the rest of the day cannot provide windfall gains (i.e., cannot affect divers’ consumption levels too much). Besides, unexpectedly high wages in the morning are not necessarily correlated to the earnings in the afternoon.

Thaler (2018, p. 1265) provides an example of self-control problem: “At a dinner party for fellow economics graduate students I put out a large bowl of cashew nuts to accompany drinks while waiting for dinner to finish cooking. In a short period of time, we devoured half the bowl of nuts. Seeing that our appetites (and waistlines) were in danger I removed the bowl and left it in the kitchen pantry. When I returned everyone thanked me”. Again, people may feel that they can start a diet plan the next day (they have choices). Also, they are unsure what the main dish is and how it tastes like. If the main dish and the bowl of cashew nuts are served simultaneously, people will not eat that much cashew.[16]

[15] Barberis (2013) suggests that “upon receiving a negative income shock, the individual prefers to lower future consumption rather than current consumption. After all, news that future consumption will be lower than expected is less painful than news that current consumption is lower than expected.” (p. 188).

[16] This is not to say that self-control problem does not exist. For example, DellaVigna, and Malmendier (2006) use a data of three U.S. health club to find that “members who choose a contract with a flat monthly fee of over $70 attend on average fewer than 4.5 times per month. They pay a price per expected visit of more than $17, even though they could pay $10 per visit using a ten-visit pass. On average, these users forego savings of over $600 during their membership” (p. 716).

7. Concluding Remarks

This paper has used the concepts in traditional economics (e.g., choice, relative price, and opportunity cost) to analyze the anomalies found in behavioral economics. The results show that quite a few anomalies, such as preference reversal, isolation effect and sunk cost fallacy, do not exist. This is not to say that people always make rational choices. The findings of the paper conclude, however, that common people may not be as irrational as behavioral economists have suggested (in some situations, common people may act more like a rational economist).

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APPENDIX

The following is a true story from Chang (2005). One day a senior student (Jade) came to my office, and told me happily that she just got admitted to a prestigious university to pursue her master degree in finance.

Jade: Professor, I am so happy that I got admitted to X university.

Professor: Congratulations! ... But did you also apply for other disciplines, such as MS or Ph.D. programs in computer science, statistics, or economics?

Jade: No. Why should I? If I pursue these degrees, then my past four-year study of finance would be a waste.

Professor: Apparently, you do not understand the meaning of opportunity cost. Your study of Principles of Economics (Econ101) and Financial Management courses is a waste and futile.

Jade: I don't quite follow you. Could you explain it to me?

Professor: Let me give you an example. A beautiful girl who just enrolls in a university meets a boy. When the boy asks her to go on a date, she agrees. Two weeks later, the boy asks for more dating, and the girl contemplates: "If I stop dating him, then my two weeks of dating (investment) will be a waste." Hence, they continue to date for another two years. After two years, the girl contemplates again: "If I stop dating him, then my previous two years of dating him will be a waste." They continue to date for two more years. After four years, upon graduation, the boy asks the girl to marry him. The girl contemplates: "If I do not marry him, then my four years of dating him will go to waste," and so she marries the boy. You are that girl.

Jade: No, I'm not. I am not that stupid!

Professor: Oh, yes, you are. If you are this discreet with your marriage, then be even more so in choosing your profession.

What matters in Jade's choosing a particular graduate program is: Does it provide positive net present value (NPV, the difference between revenues and costs), and is its NPV the largest one among all the mutually exclusive projects (graduate programs)? Costs in the NPV analysis are opportunity costs, which means that you still have the opportunity to make the choice to spend or not to spend, i.e., opportunity costs are *ex-ante* (Buchanan, 1969). When calculating the NPV of joining a finance graduate program, Jade should consider only how much more costs and time she will spend, and compare them with the revenues (cash flows) she will receive if she finishes the study. Jade’s four-year study of finance is already sunk; it is not an opportunity cost, and therefore should not be considered in decision-making.