INVESTIGATING THE LEDDO, JAYANTI AND DUAN (2019) REVISED PROSPECT THEORY VALUE FUNCTION WITH PAKISTANI STUDENTS

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ABSTRACT

Prospect Theory (Kahneman and Tversky, 1979) is a highly influential theory that predicts decision making when people are confronted with choices involving gains or losses with different degrees of uncertainty. Prospect Theory argues that people are generally risk averse when it comes to seeking gains and risk seeking when it comes to avoiding losses. Leddo et al. (2019) noted that the original formulation of Prospect Theory did not take into account people's goals. They argued that people would be willing to take risks to achieve goals but become more risk averse once those goals are achieved, and they would become risk averse when confronted with losses in order to avoid a highly negative outcome but become more risk seeking to negate the negative outcome once that outcome occurred. Leddo et al.'s research confirmed this hypothesis, leading to a revision of Prospect Theory's value function. The present research investigates whether the same revised value function can predict decisions made by people in other cultures. Accordingly, the present paper investigates whether the Leddo et al. (2019) findings will hold up with people from Pakistan, a poor country with a capitalistic economy. In the present study 80 adult professionals were given scenarios involving business decisions involving gains or losses above or below defined aspiration and avoidance levels (four scenarios in total with 20 participants per scenario). Results showed that participants demonstrated more risk-seeking behaviors for decisions involving losses than those involving gains, consistent with the original Kahneman and Tversky (1979) framework and inconsistent with the revised Leddo et al. (2019) framework but demonstrated more risk-seeking behaviors for decisions involving

outcomes below the avoidance and aspiration levels than for decisions involving outcomes above the avoidance and aspiration levels, consistent with the revised Leddo et al. (2019) framework.

INTRODUCTION

One of the most prominent and influential theories of decision making and choice behavior is Kahneman and Tversky's Prospect Theory (1979), which evolved from attempts to understand the place of expectation-based theories in describing individual decision making. Prospect Theory proposes a value function that relates actual outcome value to subjective utility and a decision weighting function which translates the stated probability of an outcome to a subjective weight that the stated probability carries in assessing the attractiveness of that outcome.

The Kahneman and Tversky value function has two distinct properties: a) it is concave for gains and convex for losses so that, for example, the difference in subjective utility between 0 and 100 dollars is not the same as the difference in subjective utility between 100 and 200 dollars, and; b) the function for losses is steeper than the function for gains so that a given amount of loss is more aversive than the same amount of gain is attractive. Figure 1 shows Prospect Theory's value function.

Since its inception, there have been many tests of Prospect Theory in a variety of contexts such as business and political decision making (Kahneman & Tversky, 2000; Jones 2001; Gilovich, Triffen& Kahneman, 2002; Weyland 2006). Many studies have cited support for some of Prospect Theory's main claims. However, results have not always been consistent. For example, Weyland (1996) found that in Latin American countries, politicians facing economic hardships would sometimes enact bold, risky policies and others would enact conservative ones. Similarly, Alghalith et al. (2012) found that investors tended to be risk seeking regardless of whether they were gaining or losing money. Riabacke (2006) examined several lumber companies. These were first grouped into established companies and new and upcoming companies. The companies were asked to choose between a new risky technology not used yet but promised to be more efficient vs the current/old technology. The established company chose the old one while the new company chose the newer technology. Thus, when confronted with the same decision, established companies were risk averse (which generally seems to be the case), whereas the newer companies were risk seeking (which generally seems to be the case).
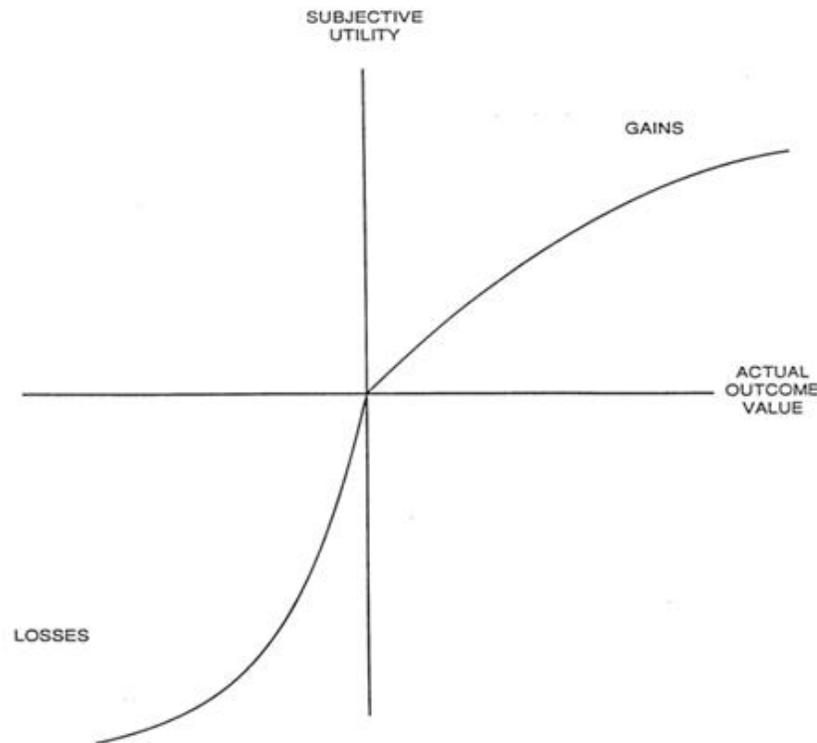
FIGURE 1. Kahneman and Tversky's (1979) value function showing relationship between actual outcome value and subjective utility.

Leddo et al (2019) Revision of Prospect Theory

Kahneman and Tversky have done an excellent job in explaining cases where people would be risk averse versus risk seeking and have shown how framing choices can lead to one tendency or the other. However, Prospect Theory fails to account for the real-world decisions described above. The reason for this may be reflected in the critique of Prospect Theory offered by Nwogugu (2005) that Prospect Theory was created based on hypothetical decisions that do not reflect the types of real-world decisions involving risk and reward that people typically face. In the real world, gains and losses may not be uniform in how they appear to the decision maker.

As a result, Leddo et al. (2019) noted that real-world decisions often occur in the context of goals, represented in terms of outcomes a decision maker is trying to achieve or ones s/he is trying to avoid. Accordingly, Leddo et al. (2019) created a revised value function that included an aspiration level that represented an outcome the decision maker is trying to achieve and an avoidance level that represented an outcome that the decision maker is trying to avoid. The inclusion of aspiration and avoidance levels in the value function leads to predictions of decision making that run counter to those of classical Prospect Theory.

For example, Prospect Theory's value function argues that each successive dollar a person receives is worth less than the previous dollar. However, suppose a person has a goal of becoming a millionaire. Prospect Theory states that the 10th dollar the person gets along the way towards achieving that goal will be subjectively worth more than the 1 millionth dollar the person gets. Common sense suggests the reverse is true. On the other hand, once the million-dollar goal is achieved, it is reasonable to argue that each successive dollar earned has decreasing subjective value.

Conversely, suppose a person owns a business that will fail if it loses 1 million dollars. Prospect Theory states that each successive dollar lost has decreasing subjective value such that the first dollar lost is subjectively more aversive than losing the one millionth dollar that causes the business to fail. Again, this goes against common sense. As with the argument in the previous paragraph, it is reasonable to also argue that once the one-million-dollar loss occurs and the business is sure to fail, any losses greater than that have decreasing aversiveness.

Accordingly, unlike the traditional Prospect Theory value function, which is concave for gains and convex for losses, the Leddo et al. (2019) revised Prospect Theory value function is convex for gains up to the aspiration level and concave thereafter and concave for losses up to the avoidance level and convex thereafter. The Leddo et al. (2019) revised value function is shown in Figure 2.
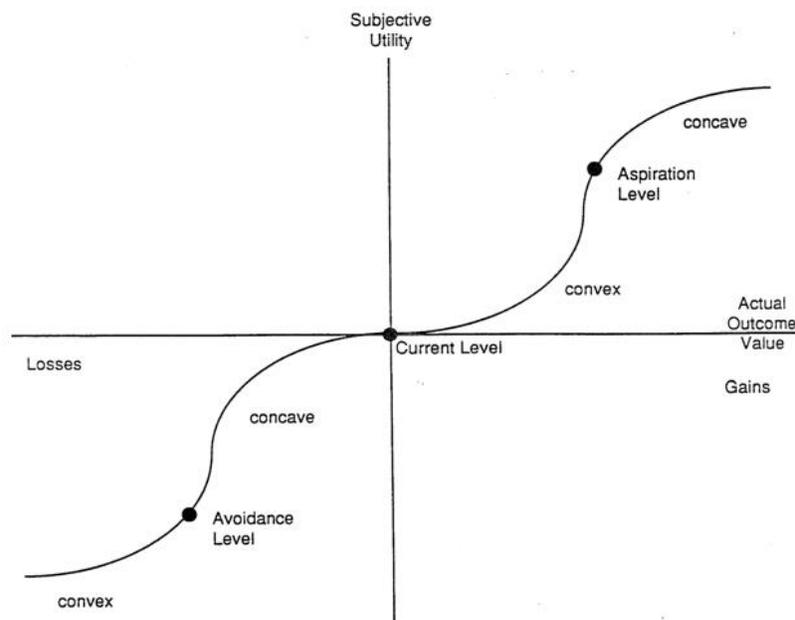

Figure 2: Revised Prospect Theory value function

The reformulated value function is useful in explaining the empirical results described earlier that appear at odds with the original version of Prospect Theory. For example, investors presumably have a very high aspiration level, so it makes sense for them to be risky when they are gaining money at levels below whatever aspiration level they set. For the lumber companies, new companies have not yet established themselves. Therefore, we would expect new companies to be below their aspiration levels and be willing to engage in risky behaviors. On the other hand, an "established" company has already achieved the goal of becoming successful (its aspiration level), so we would expect to see it to be more risk averse in decision making.

The revised value function is useful in explaining apparent discrepancies in economic policies. For example, when countries show modest economic declines, they often enact austerity programs (e.g., Greece in recent years or the sequester in the United States) that are marked by reduced government spending and attempts to reduce debt. On the other hand, severe economic downturns (e.g., the Great Depression in the 1930's or the recessions in 2008 and 2020 in the United States) are often marked by bold economic initiatives like high government spending, new programs (e.g., the New Deal during the Great Depression), and incurring large amounts of debt. This apparent contradiction can be explained using the avoidance level. As long as the economy has not reached disastrous conditions (the avoidance level), governments are risk averse, but once those levels are reached, they become risk seeking.

In addition to the Leddo et al. (2019) study, further evidence for the reformulated value function has been shown in Leddo and Shukla (2020) that found that not only do people's decisions that they make for themselves conform to the predictions of the revised value function, but so, too, do recommendations for decisions they make on behalf of their friends. In the Leddo and Shukla (2020) study, high school students were presented with scenarios in which they or their friends were applying to college and had to make decisions on whether to take the SAT or ACT test or recommend that their friends take the SAT or ACT. Scenarios varied to reflect conditions below an aspiration level (their of their friends' test scores were below the required level for the college they wanted and they were choosing between a sure gain that would still place the score below the aspiration level and an uncertain gain that would either place the score at the aspiration level or the current level), were above an aspiration level (their or their friends' test scores were at the aspiration level and they were choosing scenarios of a certain gain of 50 points or an uncertain gain of either 0 or a 100 points), were below the avoidance level (the student is choosing for him/herself or a friend between a test that has a certain chance of producing a lower test score but one still higher than the level that would cause the student or friend to be rejected by colleges being applied to and a test that will either produce the same score that the student or friend has now or one that is at the level that would cause the student or friend to be rejected by colleges being applied to), were above the avoidance level (the student or a friend has a test score that

will result in rejection by the college being applied to and the student is choosing between a test that has a certain chance of producing a test score that is 50 points lower and a test that will either produce the same score as the student or friend has now or one that is 100 points lower). In this study, students chose the risky option for themselves and their friends when their scores were below the aspiration levels, chose the non-risky option for themselves and their friends when their scores are already at the aspiration levels, chose the non-risky option for themselves and their friends when their scores were below the avoidance levels and the risky option for themselves or their friends when their scores were above the avoidance levels.

The revised Prospect Theory value function was even shown to hold up when investigated under the framing of decisions. In the classical version of Prospect Theory, Tversky and Kahneman (1981) found that the same decision could produce either risk seeking or risk aversion behavior in people depending on whether that decision was framed in terms of losses or gains. Leddo and Elkas (2021) mirrored the original Tversky and Kahneman (1981) framing study, but with inserting aspiration and avoidance levels in the gain and loss versions of the decision scenarios. When these aspiration and avoidance levels were included, people's decisions conformed to the predictions of the revised Leddo et al. (2019) value function rather than the original Kahneman and Tversky (1979) value function.

While Leddo and his colleagues have amassed considerable evidence for a revised value function when studying American decision makers, the question remains whether this revised value function would hold up when tested in other countries. In fact, it is often the case that documented social science-related findings fail to hold up in tests in other cultures (Henrich, Heine, and Norenzayan, 2010). A landmark study investigated how well the traditional probability weighting function of Prospect Theory (something we did not investigate in our revision of Prospect Theory's value function) held up in 30 different countries (Haridon and Vieider, 2019). These researchers found that, generally speaking, people in countries investigated had probability weighting functions that were similar to that in Prospect Theory in which smaller probabilities were over weighted and higher probabilities were underweighted. Nicaraguan people showed a similar pattern except that lower probabilities were over weighted even more and higher probabilities were underweighted about the same as those stated in the original Prospect Theory probability weighting function. While Nicaraguan people had the most pronounced effect in this departure from the standard probability weighting function, this general pattern was true for other low-income countries included in the study. This pattern suggested that people in low-income countries had a greater sense of optimism and higher risk tolerance than those in higher income countries. Further, Boucher and Leddo (2022) found that when it came to the value function, Nicaraguan students showed a fairly consistent pattern of risk

tolerance regardless of whether the prospects they were faced with involved gains or losses or were above or below an aspiration or avoidance level.

Tun et al. (2022) found that Japanese people behaved similarly to Americans in their decision making. Japanese people were risk seeking when outcomes were below the aspiration and avoidance levels and risk averse when outcomes were above them. On the other hand, Gu and Leddo (2022) found that Chinese students were risk averse when it came to decisions involving gains, regardless of whether the outcomes were above or below the aspiration level. However, when decisions involved losses, no Chinese student took the risky option when losses had not yet reached the avoidance level and almost all Chinese students took the risky option when losses surpassed the avoidance level. Therefore, Chinese students behaved according to the original Prospect Theory's (1979) value function when decisions involved gains—they were highly risk averse—and behaved according to the revised Prospect Theory's (2019) value function when decisions involved losses.

The purpose of the present study is to extend the original Leddo, Jayanti and Duan (2019), Boucher and Leddo (2022), Tun et al. (2022), and Gu and Leddo (2022) findings regarding the revised Prospect Theory Value function to yet another country: Pakistan. Pakistan presents an interesting case as it, like Nicaragua, has a low per capita GDP but unlike Nicaragua has a mixed economy where businesses can be owned by either individuals or the state. Moreover, research suggests that the Pakistani people tend to be relatively cautious and risk averse when it comes to making financial decisions (Yasir et al., 2014). Thus, Pakistan represents an interesting case for the revised Prospect Theory value function.

METHOD

Participants

There were 80 Pakistani citizens used in this study. They were not paid for their participation. The participants were between 24-75 years old. There were college professors who were from 50-70 years old, employees from non-governmental organizations (NGO's) who were from 40-50 years old, business owners who were from 40-50 years old, employees at multinational companies who were from 35-45 years old and government employees who were from 60-75 years old, and salespeople who were from 24-40 years old.

Materials Used

There was a total of four scenarios used. The scenarios related to business decisions involving gains or losses. Each scenario involved a choice between a sure outcome or one that has two 50-

50 outcomes that combined to produce the same expected value as the sure outcome. The four scenarios are shown below.

Scenario 1

You are managing a department within a large company. You are required to have sales of 200 million rupees by the end of the year, which is next month. Your department currently has sales of 180 million rupees. You have time to go after only one new contract before the end of the year. Contract A is worth 10 million rupees, but you are guaranteed to get the contract because the customer has told you he wants to hire your company. Contract B is worth 20 million rupees, but there is another company competing for it. Therefore, if you go after contract B, you only have a 50% chance of getting the 20 million rupees and a 50% chance that you will get nothing. Which contract will you go after, A or B?

Scenario 2

You are managing a department within a large company. You are required to produce sales of 200 million rupees by the end of the year, which is next month. Your department currently has sales of 200 million rupees, so you have met your goal. You have time to go after only one new contract before the end of the year. Contract A is worth 10 million rupees, but you are guaranteed to get the contract because the customer has told you he wants to hire your company. Contract B is worth 20 million rupees, but there is another company competing for it. Therefore, if you go after contract B, you only have a 50% chance of getting the 20 million rupees and a 50% chance you will get nothing. Which contract will you go after, A or B?

Scenario 3

You are managing a department within a large company. Your department is losing money and has currently lost 180 million rupees. If you lose 200 million rupees by the end of the year, which is next month, you will lose your job. There are two products that are doing poorly in the market and you have been told that you can cancel one of the products. If you cancel product A, you are guaranteed to lose another 10 million rupees by the end of the year. If you cancel product B, there is a 50% chance your department will lose another 20 million rupees and a 50% chance that you will lose no more money by the end of the year. Which product will you cancel, A or B?

Scenario 4

You are managing a department within a large company. Your department is losing money and has currently lost 200 million rupees. If you lose 200 million rupees by the end of the year, which is next month, you will lose your job. There are two products that are doing poorly in the

market, and you have been told that you can cancel one of the products. If you cancel product A, you are guaranteed to lose another 10 million rupees by the end of the year. If you cancel product B, there is a 50% chance your department will lose another 20 million rupees and a 50% chance that you will lose no more money by the end of the year. Which product will you cancel, A or B?

Procedure

All four scenarios were administered electronically. Each participant was given only one scenario, so that the participant's decision on the scenario would not be affected by answers given to other scenarios. The participants were simply directed to state which option they would choose. There were a total of 20 participants for each scenario.

RESULTS

In the gain scenarios, participants had to choose between going after two contracts, Contract A and Contract B. In both scenarios, taking Contract A had the guaranteed revenue and Contract B the 50-50 outcome. Therefore, choosing Contract B could be seen as the risky option.

Similarly, in the loss scenarios, to prevent further company losses, participants had to choose between cancelling two products, Product A and Product B. In both scenarios, cancelling Product A resulted in a guaranteed further loss, while cancelling Product B had a 50-50 outcome of no further losses or double the further losses that cancelling Product A would have. Therefore, choosing to cancel Product B could be seen as the risky option.

Table 1 presents the percentage of participants who selected the risky alternative for each of the four scenarios. The first row shows the results of the present study (for the Pakistani participants). The second, third, fourth, and fifth rows show the results of the Tomomi et al. (2022), Gu and Leddo (2022), Boucher and Leddo (2020) and Leddo and Shukla (2020) studies, respectively, for comparison purposes.

Table 1: Percent of participants who selected the risky outcome, broken down by type of scenario.

Nationality	Below-aspiration level gain	Above-aspiration level gain	Above-avoidance level loss	Below-avoidance level loss
Pakistani	30	10	25	60

Japanese	81	58.76	47.42	79.38
Chinese	21.70	15	0	94.40
Nicaraguan	72.73	54.55	63.64	63.64
American	90	50	30	90

The general pattern of results fits the predictions of the revised Leddo et al. (2019) Prospect Theory in that Participants tended to be more risk-seeking for gains below the aspiration level than for those above and tended to be less risk-seeking for losses above the avoidance level than for those below. One of the key differences between the original Kahneman and Tversky (1979) and the revised Leddo et al. (2019) Prospect Theory value functions is that the former predicts a main effect for gain vs loss (people are more risk seeking when faced with decisions involving losses than they are when faced with decisions involving gains) while the latter predicts no such main effect. In the present study, the overall percentage of participants selecting the risky option is 20% when the decisions involved gains and 42.5% when the decisions involved losses. This difference is consistent with the predictions made by the original Prospect Theory and is inconsistent with the revised Leddo et al. (2019) Prospect Theory, $z = 2.18$, $p < .05$.

A key difference between the revised Prospect Theory value function and the original one is the notion of goals, specifically, the aspiration level and the avoidance level. The revised Prospect Theory value function predicts a main effect for risk seeking behaviors when outcomes are above vs below goal (aspiration and avoidance) levels. Specifically, it is predicted that people are more risk seeking when outcomes are below goal levels than when outcomes are above goal levels. This was borne out in the present data where 45% of participants chose the risky option when outcomes were below goal levels, while 17.5% of participants chose the risky option when outcomes were above goal levels. This difference was statistically significant, $z = 2.66$, $p < .01$.

The revised Prospect Theory value function also predicts differences around the goal levels. Specifically, for gains, people are predicted to be more risk seeking for options when the current state is below the aspiration level than when it is at or above the aspiration level. In the present study, participants chose the risky option 30% of the time when the current state was below the aspiration level and 10% of the time when the current state was at the aspiration level, directionally consistent with the predictions of the revised Prospect Theory value function. This difference only approached statistical significance, however, $z = 1.58$, $p = .06$.

Similarly, the revised Prospect Theory value function predicts that people are more risk seeking when faced with prospective losses below the avoidance level than they are when faced with prospective losses above the avoidance level. In the present study, participants chose the risky option 60% of the time when the potential outcomes were below the avoidance level and 25% of the time when the potential outcomes were above the avoidance level, consistent with the predictions of the revised Prospect Theory value function. This difference was statistically significant, $z = 2.24$, $p < .05$.

DISCUSSION

The data from the present study showed that the choices made by Pakistani people conformed to the predictions made by the revised Prospect Theory value function and also the predictions from the original Prospect Theory value function. Specifically, Pakistani students showed a main effect in risk-seeking behaviors for gains versus losses with mean scores for gains being lower than mean scores for losses. This is consistent with the predictions of the original Kahneman and Tversky (1979) Prospect Theory and runs counter to the predictions of the revised Prospect Theory value function. On the other hand, participants showed a difference in risk-seeking behaviors when outcomes were above or below goal states, regardless of whether the prospects involved gains or losses. This result is consistent with predictions made by the revised Leddo et al. (2019) Prospect Theory value function and is consistent with our previous results with American participants (Leddo et al., 2019; Leddo and Shukla, 2020; Leddo and Elkas, 2022).

Related to this is the finding that for gains, the difference in risk seeking behaviors for decisions above and below the aspiration level approached statistical significance, when more participants chose risky options when the current state was below the aspiration level than when it was above. This is consistent with the revised Leddo et al. (2019) value function. Similarly, participants chose risky options when the current state was below the avoidance level than when it was above it, also consistent with the revised Leddo et al. (2019) value function.

The present results are noteworthy, both in the context of the Henrich, Heine and Norenzayan (2010) findings that social science findings established in one country often do not hold up in other countries, and our previous results in China (Gu and Leddo, 2022) and Nicaragua (Boucher and Leddo, 2022) that differed from those of US decision makers, while those in Japan (Tun et al., 2022) were generally consistent. Therefore, there may not be a universal framework such as Prospect Theory (even in its revised form) that can account for decision making across cultures. Rather, we need to think about creating culture-dependent predictive models and investigate more fully whether it is cultural values, relative wealth, different economic systems or some interaction among them that drives decision making behavior.

Examining Table 1 may allow us to recognize some patterns in the data across countries. Like China, Pakistan has a hybrid economy with both state-owned and privately owned business. For both countries, overall probabilities were lower than those of other countries and the only condition that produced relatively high numbers of risk seeking behaviors was that involving losses below the avoidance level. On the other hand, Japan and the US are both wealthy, capitalistic countries and participants of these countries showed similar patterns of decision making and most closely matched the predictions made by the Leddo et al. (2019) revised value function. Nicaragua represents a relatively unique case as it is both poor but essentially capitalistic (although, until recently, it had a hybrid economy that was a mixture of state-owned and private businesses). It is the lone country whose participants showed a majority preference for risky options regardless of scenario. It is possible that this attitude toward risk is a by-product of Nicaragua's new-found capitalism. Additional research may help elucidate the variables that influence under what conditions people of a given country may seek risky versus non-risky decision making options.

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