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Subjective Wealth and Decision-Making Under Risk

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Abstract: We examine the effect of subjective wealth, one's comparison of socio-economic status to others, on one's appetite for risk in a simple incentivised task. Our study recruits 104 students of De La Salle University. We observe participant risk-taking through the Warm Columbia Card Task (WCCT) and reckon subjective wealth through the McArthur Scale for Subjective Social Status (MSES). We find that an individual is 36.7% more likely to turn over a card per additional rung on the socio-economic status ladder — evidence that higher subjective wealth results in lower risk aversion. This finding is robust to a range of other estimations, including those that account for absolute wealth and sex, and employ alternative techniques. Our results are some of the first to confirm the hypothesis that low levels of subjective wealth may exaggerate risk aversion.

Key Words: subjective wealth; risk-aversion; decision-making

1. INTRODUCTION

Does poverty affect individual decision-making? Shah et al (2018) provide evidence that it does, arguing that financial pressures felt by the poor result in changes in the way they reason and choose, developing preferences that favor short-term relief. Studies like theirs not only provide partial explanations for self-defeating or harmful behaviour among the poor, but they shift focus away from traditional explanations of poverty as external deficiencies (lack of access to capital, education, good governance, etc.) toward psychological explanations. In particular, to patterns of sub-optimal decision-making that prevent impoverished households from permanently increasing their income.

In the standard economic model, sub-optimal decisions result from underestimated costs and overestimated benefits (Li, 2017). A hungry person may opt to spend money on a large meal today rather than save for another meal tomorrow. The satisfaction of eating now is overemphasised and the prospect of future hunger downplayed. This falls under a range of "maladaptive" behaviors that may prevent a person from adapting to circumstances (Bechara et al, 2000).

While it is common for individuals to underestimate costs and overestimate benefits, doing so is perhaps more consequential for the poor (Bertrand, 2004). Experimental studies have found evidence of the relationship between maladaptive behavior and lower levels of wealth. For instance, Mani et al. (2013) find poverty increases stress, which then hinders a person's mental capacities. In their study, farmers displayed a decreased level of cognitive ability before harvests as compared to after harvests, a difference in cognitive ability not explained by stress, time frame, nor work effort. Instead, the differences seemed correlated with shifts in the mental resources consumed by poverty-related thoughts felt before and after a harvest.

Poverty has also been shown to induce negative stress resulting in short-sighted decision-making. A study by Haushofer and Fehr (2014) shows how among the poor, short-term habitual behavior is favoured over long-term goal-oriented behavior, with similar findings also suggested by Carvalho et al. (2016) comparing decision-making before and after

payday. They show people biased towards immediate monetary gratification prior to payday as opposed to after payday, suggesting the scarcity faced by a person pre-payday raises concerns about financial liquidity, resulting in a preference towards immediate monetary rewards.

Ronzani et al. (2018) were among the first to directly study the relationship between absolute wealth — whether a person is objectively rich or poor — and decision-making under risk. Adopting Figner and Weber's (2011) methodology, they used the so-called Warm Columbia Card Task (WCCT) to analyze an individual's decision-making under risk relative to the participant's absolute wealth (rich, poor). They conclude negligible effects of absolute poverty on overall risk-taking.

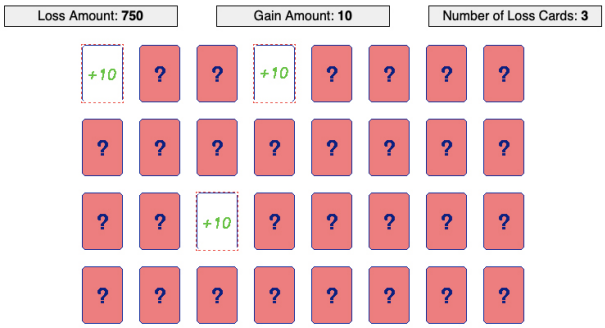
We posit here that it may be *subjective* wealth, i.e., one's self-evaluation of socio-economic status relative to others, that influences risk-taking — not absolute objective wealth. A vast literature on the psychological and physical effects of status-consciousness and inequality exists, perhaps best summarised in Pickett and Wilkinson's "The Spirit Level" (2009).

In this study, we adopt the quasi-experimental design of Ronzani et al. (2018), utilising the Warm Columbia Card Task (WCCT). In WCCT, participants gamble by turning over cards based on the information given to them about potential gains, losses, and their probabilities. The "warm" variant of the CCT is selected because it allows participants to be updated in real time about changes in the given information, compared to the "cold" version of CCT (CCCT), in which players pre-specify their decisions without being informed about changes to current odds. WCCT enables us to study how decision-makers adapt their choices to changes in available information.

2. METHODOLOGY

Sample. We recruit 104 students from De La Salle University (DLSU) via the university's social platforms and random sampling at the university's common halls. Both recruitment methods have become standard for field and lab experiments (Price et al, n.d.). Data gathering was conducted one-on-one between participants and experimenters.

Figure 1: Warm Columbia Card Task Layout



Task. Each participant is asked to play a computerised version of the WCCT, depicted in Figure 1. In a deck of 32, a variable number are "gain" cards, and the remainder "loss" cards. When a gain card is turned over, a corresponding amount is awarded; with a loss card, a penalty is deducted. The subject is informed of the award (gain), penalty (loss), plus the number of loss cards (probability). Each round, participants are asked to turn over as many cards as they feel comfortable doing, with every round featuring a different combination of gains, losses, and probabilities.

Rounds end when either: (1) the participant turns over a loss card, or (2) the participant no longer wishes to turn over any cards. Participants begin each round with initial wealth of Php 0.00 — earnings from prior rounds do not carry over. The task is then repeated for 24 trials.

Table 1: Values for Decision Variables

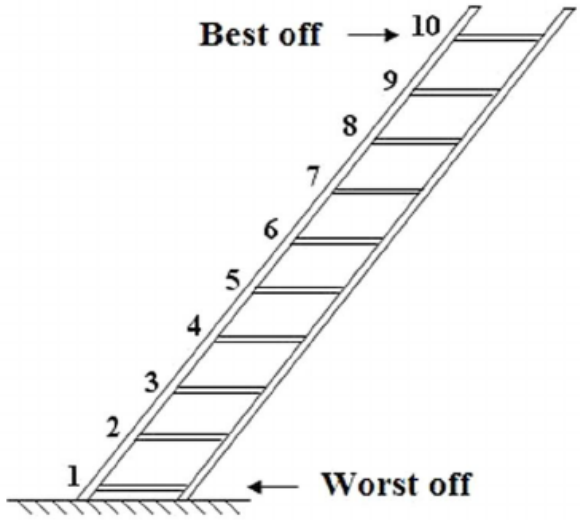
	Potential Gain	Potential Loss	Probability
High	Php 75.00	Php 1,050.00	3/32
Low	Php 25.00	Php 350.00	1/32

In Table 1, we find potential gains, potential losses and odds for two versions of the WCCT. When a player is informed that the game is High, it means 29 of the cards feature gains of Php 75, but three out 32 carry potential losses of Php 1,050. If the game at hand is Low, it means 31 of the cards carry gains of Php 25, but one card carries a loss of Php 350.

Design. The experiment is carried out on three mobile terminals using a programmed version of the WCCT. Before executing the task, individuals are asked if they would like to participate without any

guarantee of compensation other than what may be earned within the experiment. With consent, participants are briefed on the task, duration, and compensation scheme. Participants are then provided instructions on how to play the game, and four practice rounds are conducted.

Figure 2: MacArthur Scale for Social Status (MSES)



MacArthur Scale of Subjective Social Status (MSES). The MSES is presented in the form of a ladder: the wealthiest students are on Rung 10, the least wealthy on Rung 1. Individuals are asked what rung they identify with, relative to other students they know. A higher rung indicates a higher degree of subjective wealth, and a lower value indicates a lower degree of subjective wealth.

To ensure that differences between different levels of subjective wealth on the MSES are not due to systematic differences in the characteristics of participants, each was asked to answer an additional three post-task questionnaires: the Socio-Economic Panel (SOEP) risk preference survey, (2) the MIDUS (Midlife in the United States Series) control belief scale, and (3) a questionnaire on personal information.

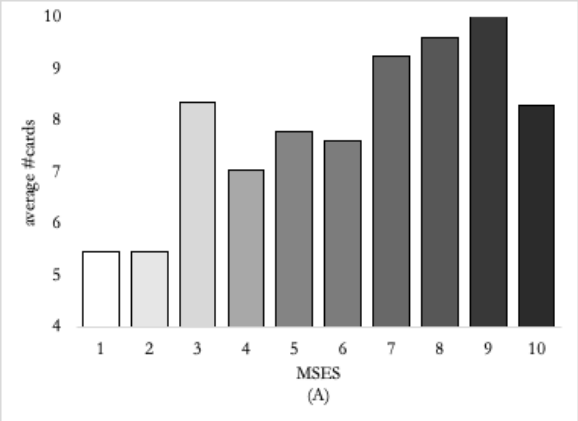
Payout. At the end, the average of accumulated wealth across 24 rounds is computed and paid out in cash. In addition to the payout earned from the task, participants are also paid a token of Php 50.00, representing the opportunity cost of their time. Approximately Php 12,000.00 was paid out to participants.

3. RESULTS AND DISCUSSION

The distribution of the key variable MSES registers minimal occurrences for Levels 1-3, 10 occurrences at Level 4, 20-22 at Levels 5-7, 15 at Level 8, tailing off at fewer than five for Levels 9-10. Note that there is no reason to suspect different distributions for different populations that interact within the same social circles. If a population of low-income students were sampled, most might well consider themselves at Levels 5-7 ("average wealth") if their most of their peers and neighbours were low-income. MSES measures perceived relative status, not actual economic status.

Our key finding is captured in Figure 3. It divides the data into deciles and plots the average number of cards turned over per rung on the MSES. The upward trend suggests a positive relationship between a participant's rating on the MSES and the average number of cards turned over. That is, an individual who self-rates wealthier on the MSES turns over more cards, and an individual who self-rates poorer on the MSES turns over fewer cards.

Figure 3: Average Cards Per Level Plotted Against the MSES



In Table 2, we fit a regression

(1) $Number\ of\ cards\ turned\ over = \beta_0 + \beta_1 probability(high\ or\ low) + \beta_2 gain(h,l) + \beta_3 loss(h,l) + \beta_4 MSES + \beta_5 SOEP + \epsilon$

The various specifications reinforce the same pattern seen in Figure 3: a positive relationship between *MSES* and the number of cards turned over.

Table 2: Summary of Estimations

Variables	OLS	Tobit	Tobit (HDI)	Tobit (*sex*)	SCLS
probability (indicates a high or low probability of loss per round)	5.018***	0.235***	-0.235***	-0.235***	-0.224***
	(-18.03)	(-17.64)	(-17.64)	(-17.64)	(-13.49)
gain (indicates a high or low potential gain per round)	0.695***	0.0248*	0.0249*	0.0249*	0.071***
	(0.32)	(1.82)	(1.83)	(1.83)	(4.11)
loss (indicates a high or low potential loss per round)	-1.229***	-0.092***	-0.092***	-0.092***	-0.0399**
	(-4.52)	(-6.92)	(-6.91)	(-6.91)	(-2.35)
MSES (subjective wealth from the MSES ladder)	0.517***	-	-	-	-
	(3.24)	-	-	-	-
SOEP (risk preference from the SOEP risk-preference survey)	0.384*	-	-	-	-
	(1.91)	-	-	-	-
logMSES (log transformation of *MSES*)	-	0.362***	0.367***	0.366***	0.336***
	-	(2.96)	(3.01)	(2.97)	(5.65)
logSOEP (log transformation of SOEP)	-	0.514***	0.495***	0.499***	0.412***
	-	(2.90)	(2.78)	(2.77)	(5.17)
roundbreak (indicates if a participant turned over a loss card per round)	-	-0.238***	-0.238***	-0.238***	-0.117***
	-	(-15.98)	(-15.96)	(-15.96)	(-6.98)
experience (participant's cumulative number of rounds played)	-	-0.002**	-0.002**	-0.002**	-0.0002
	-	(-2.07)	(-2.07)	(-2.07)	(-0.14)
MIDUS-C (score on the MIDUS questionnaire on perceived constraints)	-	0.0477**	0.050**	0.049**	0.0458**
	-	(2.3)	(2.38)	(2.38)	(5.33)
HDI (a proxy for absolute wealth from the personal information questionnaire)	-	-	0.020	0.021	0.0183
	-	-	(0.79)	(0.80)	(1.62)
sex (male or female from the personal information questionnaire)	-	-	-	-0.006	-0.0117
	-	-	-	(-0.15)	(-0.69)
Constant	5.095***	0.2414	0.196	0.196	0.168*
	(2.61)	(1.25)	(0.98)	(0.98)	(1.78)
Observations	2496	2411	2411	2411	2411

*** p<0.01, **p<0.05, *p<0.1. T-statistic in parenthesis. Dependent Variable: cards turned over

As already mentioned, the variable *MSES* and its variation *logMSES* are used as proxies for a participants' self-rated subjective wealth.

In our naïve panel OLS estimation with robust standard errors, only 16.73% of the variance in the number of cards turned over is explained. Our variable of interest, *MSES*, is significant, sharing a positive relationship with the number of cards turned over (t=3.24, p=0.001).

We then address econometric issues, beginning with the form of the dependent variable, which is discrete and truncated at a lower and upper limit of zero (0) and thirty-two (32) respectively, by log-transforming it. We also take logs *MSES* and *SOEP*. To address the truncated data, we re-estimate *Equation 1* via a Tobit model, whose assumptions support clustering around a particular value.

We also recognise that a participant's behaviour may be influenced by experience accumulated throughout the 24 rounds of the WCCT. We expect that a participant will gradually turn over fewer cards as rounds progress, the principle being that people may become more risk-averse as they gains experience in risk-taking (Menkhoff et al, 2006). We thus introduce the variable *experience* to represent the cumulative rounds a participant has played.

Finally, we note a technicality built into the WCCT: a participant who turns over a loss card is no longer able to turn over more cards. Therefore, a participant's decision to turn over more cards is stopped prematurely if she turns over a loss card. To account for this, we introduce the variable *roundbreak* which takes a value of one if a participant turns over a loss card during the round, and zero otherwise.

The second column of Table 2 summarises the results of the revised model. Our variable of interest, logMSES (t-ratio= 2.96, p= 0.003), remains significant suggesting that subjective wealth does, in fact, drive the decision-making of the participant. Further, the sign of the coefficient remains positive, consistent with the pattern seen in Figure 3.

We consider three additional issues: (1) the role of absolute wealth, (2) the differences in decision making between males and females, and (3) the use of alternative estimators.

It is possible that the variable *MSES* and *logMSES* found in the first and second columns of Table 2 may be inadvertently standing in for other drivers to decision-making. It is possible that participants actually base their decision-making on how objectively rich or poor they are, as opposed to how rich or poor they think they are. This is precisely the thesis of Ronzani (2018) who studied decision-making and objective wealth. We address this by appending the variable *HDI*, a measure of housing quality, as a proxy for absolute wealth. The third column of Table 2 captures the results of the estimation. The variable *HDI* (t=0.79, p=0.430) is found to be insignificant, with no significant changes in the results of *logMSES*. This affirms our hypothesis that subjective wealth better explains the process of decision-making.

Second, the possibility that the decision-making of men is fundamentally different from that of women. To address this, we append the variable *sex*. Our results indicate the variable *sex* (t =-0.15, p=0.330) is insignificant (see the fourth column of Table 2) and results in no substantial change in the significance and sign of our variable of interest, *logMSES*.

Finally, we re-estimate our model using SCLS, an implementation of the symmetrically censored least squares estimator proposed by Powell (1986). The fifth column of Table 2 indicates that virtually all variables, including *logMSES* (*t-ratio*=4.11 , p<0.001), maintain their sign and significance.

Our primary results indicate that every percentage increase in the variable *MSES* is accompanied by a 36.70% increase in the number of cards turned over, suggesting that the decision-maker is sensitive to changes in subjective wealth. The wealthier a decision-maker thinks she is, the less risk-averse she becomes.

Why might subjective wealth drive risk-taking behavior? We believe that lower self-ratings of subjective wealth intensify risk aversion in a way that is consistent with distressed individuals believing they have a smaller margin of error in making decisions (Bertran et al., 2004). As a result, those who believe themselves less wealthy (regardless of whether they actually are) become

more sensitive to the negative outcomes of their gambles. In our study, all participants were informed that they would not pay in the event that they incurred a negative payoff from the WCCT. This would mean that participants stood to make a costless gain. Despite this, participants remained risk-averse, with those who scored lower on the MSES displaying a stronger degree of risk-aversion. Playing the game essentially without risk of actual loss suggests the conservative behavior we observe is robust among participants who believe they are relatively poor. It is therefore possible that the perception of being poor has an automatic and unconscious effect on the participant's decision-making under risk.

4. CONCLUSIONS

Subjective wealth carries robust explanatory power for decisions made under risk, adding to a growing list of physical and psychological outcomes traceable to feelings of relative economic superiority or deprivation. It turns out that even if decision-makers are not objectively poor, the belief that they are less wealthy than their peers can enhance a range of tendencies including their risk aversion, even when faced with riskless opportunities for gain. Such seems the power of relative comparison and status-seeking, a phenomenon no doubt worthy of further economic theorising and testing.

5. ACKNOWLEDGMENTS

The authors declare no conflicts of interest.

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