

‘RELATIVE SOCIAL STANDING’: REFERENCE GROUP EFFECT ON WEALTH ACCUMULATION – AN EXPERIMENTAL APPROACH

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ABSTRACT

This study intends to find the effect of reference group influence on wealth accumulation using a lab experiment. Specifically, it seeks to find the link between the scores of the participants in the experiment and the effect of comparison with their chosen referents. The effect of comparison with reference group that contributes to wealth accumulation is termed ‘Relative Social Standing’. 220 university students were recruited and assigned randomly to treatment or control group. A game is used as the activity to produce a measurable outcome which is the number of coins obtained. The treatment group was allowed to view the scores of coins obtained by their referents before the game while the control group did not view any score of others. The difference of outcome between these two groups are attributed to the intervention of viewing others’ scores which creates the effect of comparison. The total amount of coins accumulated in the experiment represents wealth accumulation. The findings showed that the effect of intervention is statistically significant, and there is a negative correlation between the change in score and the effect of comparison. This study gauged the effect of reference group using an experimental approach instead of conventional self-reporting questionnaires.

Keywords: Comparison; Lab experiment; Reference group; Relative social standing; Wealth accumulation.

Received: 6 May 2019

Accepted: 17 February 2020

1. INTRODUCTION

Wealth accumulation has been the central theme of most economic research since the time of Adam Smith (Bentham, 1781; Tuttle, 1891; Warneryd, 1999) and is still an ongoing topic for research (Cagetti, 2003; Zhang & Huang, 2018). Wealth accumulation starts from saving; economists agree

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that saving is one way to become wealthy and some equate savings with wealth (Akerlof & Shiller, 2009; Furnham, 1985). Savings research were studied under the umbrella of consumption (Duesenberry, 1949; Friedman, 1957; Keynes, 1936; Modigliani & Brumberg, 1954) and the most popular model is the Life Cycle Hypothesis (LCH) (Cagetti, 2003; Carroll, 1997). LCH seemingly implies that wealth accumulation naturally results from saving and is not an intentional action, contradicting general observation.

Economists have, in many ways indicated the role of psychology in consumption, saving and wealth accumulation. Keynes' fundamental psychology law and the forward-looking aspect of Friedman's hypothesis are all related to the effect of psychology on this issue (Friedman, 1957; Katona, 1975; Keynes, 1936). Duesenberry (1949) introduced the concept of comparison with reference group in the Relative Income Hypothesis (RIH), however the saving function in RIH did not include the effects of social influence. While the reference group effect is a recognized psychological factor, it is rarely applied in the study of saving and wealth accumulation. Overall, many policy recommendations on savings are not actually effective (Akerlof & Shiller 2009; Amir et al., 2005) ergo, the psychological effect of reference group in economics studies of saving and wealth accumulation should be further explored (Akerlof & Shiller, 2009; Nyhus, 2017; Warneryd, 1999). Researchers also recommended the use of experimental data to study relationship of variables related to saving and social interactions (Manski, 2000; Warneryd, 1999). Thus, this study uses lab experiment to find the relationship between the effect of comparison with reference group and the experiment outcome. It involves a coin digging activity and the outcome of the experiment is measured by the total amount of coins obtained over a few rounds of this activity; the total amount of coins obtained is used as a proxy of wealth accumulation.

Findings of this experiment showed the causal relationship between the effect of comparison with reference group and the amount of coins accumulated. This implies people can be motivated to devote resources to increase wealth by exposing them to the achievement of their referents. The effect of comparison with reference group that compels an individual to devote effort and resources into increasing their wealth is termed 'relative social standing'¹. This paper proposes relative social standing to be considered as a contributing factor to wealth accumulation, amongst other established factors such as financial literacy and saving rate (Behrman, Mitchell, Soo, & Bravo, 2010). We designed a game called The Silver Digger Challenge which contributes to experimental economics in that the effect of reference group is gauged directly instead of the conventional questionnaire approach. In this experiment, referents were chosen by the participants.

2. LITERATURE REVIEW

2.1. *Economic Psychology*

Economic psychology applies psychology to the study of economic behaviour. Economic psychologists have carried out empirical research on saving but have not yet developed as many theories about the psychological factors influencing saving behavior (Nyhus, 2002; Warneryd, 1999). Social Comparison Theory (Festinger, 1954) states that there is a drive within individuals to evaluate their opinions and abilities in order to reaffirm that their decisions are right (Myer, 2013;

¹ This term was first introduced in the Malaysian National Economic Conference 12th PERKEM 2017.

Suls & Wheeler, 2012); by utilizing the information about others' standings and opinions, one tries to make accurate self-assessment or enhance their self-esteem (Myer, 2013; Suls & Wheeler, 2012). People often choose their own comparison referents, as according to Festinger (1954): "Given a range of possible persons for comparison, someone close to one's own ability or opinion will be chosen for comparison." Festinger's initial self-evaluation theory led to research in the concepts of downward and upward comparisons (Schachter, 1959; Suls & Wheeler, 2012; Wills, 1981).

Downward comparison theory (Wills, 1981) posits that people experiencing negative affect can enhance their subjective wellbeing through comparison with a less fortunate other. Research was done on psychological factors that influenced downward comparisons (Buunk & Gibbons, 1997; Major, Testa & Blysm, 1991) and experiments showed downward comparison helped medical patients to adjust better emotionally (Suls & Wheeler, 2012). Conversely, Suls and Tesch (1978) found that students who failed an exam preferred to know the scores of high performers, which is evidence for upward comparison. Myers (2013) believes, when a person experiences an increase in achievement, that person would be inclined to raise the standards by which they evaluate their attainments, thus they are comparing 'upward'. How we feel depends on whom we're comparing ourselves with (Myers, 2013; Zagefka & Brown, 2005) and where do we stand relative to our comparisons. As Social Comparison Theory is found in the field of economics on income (Clark & Senik, 2010; Liu & Wang, 2017), Duesenberry (1949) applied this idea in RIH. We believe that social comparison applies as a motive of wealth accumulation: people tend to compare their ability to earn income or accumulate wealth relative to a reference group. Generally, people compare upward so that the reference group's level of wealth (or ability to accumulate wealth) acts as motivation to pursue their own level of wealth; they compare downward so that they enhance their own self-esteem to avoid such a lowly state. Thus, this experiment studies the effect of comparison with referents of the participants and the effect of upward comparison and downward comparison.

Becker's (1974) theory of social interaction states that characteristics of other persons affect the output of an agent. The perception of other persons affects the agent, in this case, the relative standing between the achievement of the agent and the other persons the agent is comparing with. Becker assumes the agent is able to change his standing by devoting resources and effort to improve his standing. Kahneman and Tversky (1984) believes decision analysis is based on total wealth and that outcome of gamble are framed relative to the asset positions that incorporates initial wealth. Hence, this study predicts that wealth accumulation is related to initial wealth and the effect of comparison with reference group. This is referred to in the regression model in section 5.

2.2. *The Role of Reference Group*

The concept of reference group starts from relative deprivation in which a person feels they are subjectively disadvantaged compared to a relevant referent. This concept, employed throughout social science studies (Solomon, 2018; Stouffer, Suchman, DeVinney, Star, & Williams, 1949), explains how people subjectively interpret their reference group's and their own position in society which influences their emotional and behavioural reactions. Warneryd (1999) believes certain groups of the population may have norms that people who claim to belong to the group should not display extravagant consumption which perhaps involves saving money. In social psychology, this phenomenon is described as 'reference group' influence. Thompson and Hickey (2008) defined reference group as "groups that people refer to when evaluating their qualities, circumstances,

attitudes, values and behaviours". Reference groups may be aspirational – asserting positive influence which leads to special conformity in the groups, but other reference groups may instead assert negative or opposing beliefs and behaviors (Festinger, 1954; Warneryd, 1999).

Social comparison and reference group have appeared as economic concepts since 1899 with Veblen's "conspicuous consumption" which pointed out social influence on the consumption of certain goods as means to impress others. Duesenberry applied the concept of reference group on consumption and saving in 1949 which impressed Warneryd (1999) as a new concept. Empirically, it's difficult to establish which persons serve as the referent. Warneryd suggests three approaches. The first approach was asking the respondents whom they compare themselves with; he listed, among others, "neighbors, friends and acquaintances, colleagues at work, people with same level of education...". The second approach was asking about socio-demographic characteristics such as: "people you see often such as friends, neighbours, acquaintances or perhaps colleagues". The typically requested characteristics were average age, education, annual income, average weekly working hours and types of occupation for both spouses. These are useful for testing for group similarities and saving. The third approach is by using attitude statements such as 'When I compare myself with my friend, I find that I am better off' (Warneryd 1999 p.294). Similarly, Holland (2010) listed "coworkers, family members, friends, members of the same religion, previous-self and fictional characters (from movie or TV)" as comparison group and "To what degree do you compare yourself to your coworker?".

In the research of decision making, Kahneman and Tversky (1984) concluded that hedonic reference point was affected by social comparisons. In economic research, Warneryd (1999) pointed out the fact that consumers influence other consumers has been neglected and that economics disregards the importance of the individual's social environment. While there are many studies of social influence on consumption, few studies are concerned with social influence on saving (Nyhus, 2017) and wealth accumulation. Studies on reference group are rare in empirical studies probably because its influence is difficult to measure practically (Warneryd, 1999). Most studies on reference group influences were conducted by survey (Clark & Senik, 2010; Holland, 2010). This study, however, solicits the influence of reference group through the intervention of score comparison in an experiment. It shows the participants' change in effort after they are exposed to the treatment because seeing others similar to oneself succeeding in something helps to build the belief that they themselves are also capable of being successful in the same activity (Bandura, 1994).

2.3. *Lab Experiment*

Experimental research is considered robust and trustworthy in causal findings: it tends to be very strong in terms of internal validity (Bryman, 2012; Smith, 1982). Economic experiments on individual choice traced back to 1931 on an experiment testing ordinal utility theory (Roth, 1993). According to Bastable (2008), laboratory experiments conducted to study economic theory around 1950s "brought new standards of rigour to the data gathering process." Since then, the experimental approach has expanded to cover bargaining, social preferences, gender discrimination, etc. Recent development includes neuro-economics (Camerer, 2007). When behavioural economists investigate the relationship between psychology and economic behaviour; lab experiments are extensively used in their research (Ariely, 2009; Camerer, 2007).

In a research on inequality and visibility of wealth, Nishi, Shirado, Rand, and Christakis (2015) used arbitrary endowment units of 500 as initial wealth for each individual who played a cooperation game lasting ten rounds in 30 minutes. The individual interacted to either gain or lose wealth by quantum of 50 units. The balance of the units was converted to real money at the end of the game. The total amount of virtual token accumulated over the ten rounds were considered the total wealth accumulated of the subjects. Warneryd (1999) mentioned, studies on the decision processes in consumption and saving were carried out by using tokens with the aim to develop a behavioral theory of saving. In line with Nishi et al. (2015), this experiment uses coins as a unit of wealth; the total coins accumulated and kept by the participants after the game, is the proxy of wealth accumulation.

3. RESEARCH PROBLEM AND HYPOTHESES

Under-saving affects many countries including the United States which saves less than 10% (Akerlof & Shiller, 2009; Feldstein, 2018). In 2016, data from the Malaysia Department of Insolvency show many Malaysians lack retirement savings and more than ten people (below age 35) go bankrupt daily (Shagar, 2016). This brings to attention the importance of studying the factors that likely motivate people to save and accumulate wealth for retirement, especially amongst the young adults (Lusardi & Mitchell, 2007; Shiller, 2017). For people who do not save or do not save enough, an exposure to how others allocate resources for improvement of saving may motivate them to change their resource allocation methods, thus helping them save or improving their wealth accumulation. Literature reviews in social psychology showed that people either compare upwards or downwards. This comparison can be motivational either way. However, for the motivation to be effective, there must be some similar traits between both parties. The similar traits of the referent that attract people to emulate them are in accordance with the Similarity Theory (Festinger, 1954; Manski, 2000).

This study intends to find the effect of 'relative social standing' on the effort of people allocating their resources for improvement of wealth accumulation. 'Relative social standing' is defined as the effect of comparison with reference group that compels an individual to devote effort and resources into increasing their savings and wealth (Poh, Nor Ghani, & Othman, 2017). The broad objectives of this research are to explore:

1. Whether comparison with reference group's achievement affects an individual in their own achievement,
2. How wealth accumulation is related to comparison with reference group.

The study of decision behaviour in a laboratory setting has important and significant application to the development and verification of economic theories (Smith, 1976). Manski (2000) highlighted that a common objective of experiments has been to learn whether certain forms of interactions would explain why the observed behaviour of agents that belong to the same group tended to be similar. Thus, the (alternative) specific research hypotheses pertaining to the experiment are listed below.

- H1a: There is a significant difference in the outcome of the experiment between the treatment group and the control group.*
- H1b: There is a significant relationship between the effect of comparison with reference group and the outcome of the experiment.*
- H2a: There is a significant relationship between the upward comparison effect with reference group and the outcome of the experiment.*
- H2b: There is a significant relationship between the downward comparison effect with reference group and the outcome of the experiment.*
- H3a: There is a significant relationship between the gender of the participants and the gender of their reference group.*
- H3b: There is a significant relationship between the ethnicity of the participants and the ethnicity of their reference group..*

4. METHODOLOGY

The activity used in this study is named The Silver Digger Challenge. Each participant was to take out as many coins as possible from a glass each containing 100 silver coins. The tool used to take out the coins was a long plastic spoon. Each participant was given one minute, which was considered one round of challenge. The total time spent per experiment is about 30 minutes. There were two parts to the experiment in this research. In part one, all the participants did a round of challenge together in the Trial Round. In part two, the participant proceeded to First Round, Second Round and Third Round on an individual basis guided by a research assistant. The participants were randomly assigned to treatment group or control group. The intervention given in the treatment group is the viewing of their referents' scores while the control group did not view others' scores. Viewing other participants' score gives the effect of comparison (Liu & Wang, 2017; Suls & Tesch, 1978). In the First Round, the participant viewed the score obtained from the Trial Round of the referent they chose. Their scores were compared before proceeding to the First Round's challenge. This process of viewing referent's score was repeated for the Second and Third Round. The difference of outcome between the treatment group and the control group is attributed to the effect of comparison of scores between the participants and their referents.

The total scores of the First Round to the Third Round measured the total wealth accumulated, consistent with the research of Nishi et al. (2015). The scores obtained in the Trial Round are named the TrialScore, which is regarded as the pre-test scores. The scores obtained from the First Round (FirstScore) to the Third Round (ThirdScore) were regarded as the post-test scores. This is in accordance with a true experiment design. This experiment uses monetary reward; no deception is used, consistent with the requirement of experimental economics (Loewenstein, 1999; Ranyard, 2018; Roth, 1993).

The participants in the treatment group had to indicate whether they expected their referents to perform better or worse than them before they viewed their referents' scores. After viewing the referents' scores, the participants indicated whether the referents' scores were according to their expectation. These were used to gauge whether the participants were comparing upward or downward. All the participants answered a set of questionnaires pertaining to their socio-demographic information at the end of the experiments.

The experiment was conducted in November 2018 on undergraduate and post-graduate students from the National University of Malaysia (UKM); recruitment was via WhatsApp messages, class announcements and flyers notices. The sample size was calculated at 102 per group by using G*Power 3.1.9.2 by setting alpha and power of test at 0.05 and 0.8 respectively and a medium effect size at 0.5 (Cohen, 2008). Since UKM is a public university, the population ratio was expected to be close to the population ratio of Malaysia consistent with the approach of Ting, De Run, and Jee (2015). There is no fixed rule in determining the sample size for experimental studies. The beer experiment on the influence of expectation by Lee, Frederick, and Ariely (2006) recruited a total of 388 participants with allocation of 90, 139 and 159 participants in three experiments; Norton, Mochon, and Ariely (2012) studied the IKEA effect on exertion of effort used a sample size between 39 to 118.

An issue faced by lab experiment is validity. Internal validity refers to the confidence we place in the cause and effect relationship of the experiment and is highly established in lab experiment. However, the threat of extraneous variables that affects internal validity of an experiment remains, even though the experiment is well controlled. External validity is the extent of generalisability of the results of a causal study to other settings. There is a trade-off between internal and external validity (Cavana, Delahaye, & Sekaran, 2001). Most economists emphasize internal validity as sufficient to model elementary behaviour (Schram, 2005; Smith 1982). This study took many steps to ensure validity of the experiment including separating pre- and post-experiment individuals, not giving indication to the participants of being in either control or treatment group, etc.

5. FINDINGS AND DISCUSSIONS

A total of 220² participants attended the experiment, of which 198³ completed all the rounds of challenge, or 99 per group. This number is slightly short of the targeted 102 per group as planned. The demographic information is presented in Table 1 below. The ratio of ethnicity is slightly low for the Bumiputra in the control group while ratio for female is higher than male.

Table 1: Demographic Characteristics of 198 Participants Who Completed the Experiment

		Bumiputra	Chinese	Indian	Total
Control group	Female	35	22	5	62 (62.6%)
	Male	22	10	5	37 (37.4%)
	Subtotal	57 (57.6%)	32 (32.3%)	10 (10.1%)	99 (100.0%)
Treatment group	Female	31	32	8	71 (71.7%)
	Male	17	8	3	28 (28.3%)
	Subtotal	48 (48.5%)	40 (40.4%)	11 (11.1%)	99 (100.0%)

² The collection of data stopped at 220 as the scores showed sign that the participants might had learned about the procedure of the experiment before entering the experiment.

³ There were ten participants under ethnicity of Others. They were not included in the analysis as all the ten happened to be under control group but none in the treatment group.

The variables used in this study are listed in Table 2.

Table 2: Variable Names for the Experiment

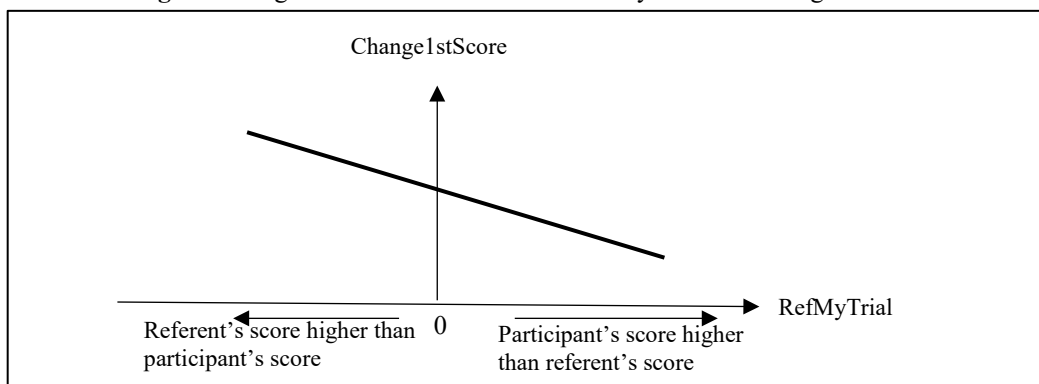
Variable Name	Description
TrialScore, FirstScore, SecondScore, ThirdScore	Scores obtained by participant in the Trial Round, First Round, Second Round and Third Round, respectively.
RefTrialScore, RefFirstScore, RefSecScore	Scores obtained by referent of the participant in the Trial Round, First Round and Second Round, respectively.
TotalAccumulated	Total amount of coins obtained by taking the sum of FirstScore, SecondScore and ThirdScore of the participants.
DiffScore	ThirdScore minus TrialScore, measuring the difference in score between pre-test and post-test.
Change1stScore	FirstScore minus TrialScore
Change2ndScore	SecondScore minus FirstScore
Change3rdScore	ThirdScore minus SecondScore
RefMyTrial	Participant's TrialScore minus their referent's TrialScore (TrialScore – RefTrialScore), measuring comparison of score in the Trial Round.
RefMyFirst	Participant's FirstScore minus their referent's FirstScore (FirstScore – RefFirstScore), measuring comparison of score in the First Round.
RefMySecond	Participant's SecondScore minus their referent's SecondScore (SecondScore – RefSecScore), measuring comparison of score in the Second Round.

To start with, DiffScore and TotalAccumulated are used to test hypothesis *H1a*. DiffScore (ThirdScore minus TrialScore) is reported as (mean \pm standard deviation). The DiffScore for treatment and control groups are (35.02 \pm 21.29) and (28.84 \pm 19.64) respectively. An independent-samples-t-test is run for this purpose. The assumptions for test are met with normality tested by Shapiro-Wilk ($p > 0.05$) and homogeneity of variances assessed by Levene's test for equality of variances ($p = 0.710$). The treatment group achieves a higher mean score than the control group by about 6 coins which is statistically significant with $t(196) = 2.123$, $p = 0.017$. For the TotalAccumulated, the assumptions are met (Shapiro-Wilk's $p > 0.05$, Levene's $p = 0.563$). The treatment group accumulates (189.79 \pm 41.95) coins compares with (180.01 \pm 40.72) coins by the control group. The treatment group has achieved a higher accumulation than the control group by about 10 coins, statistically significant with $t(196) = 1.664$, $p = 0.049$. These results show there is sufficient evidence not to reject the alternative hypothesis and to conclude that the scores of coins in the treatment group is statistically significantly higher than the control group. The positive DiffScore exhibits that a factor of skill is involved where the participants became more skilful with more rounds of challenge. However, the higher score in the treatment group shows the effect of reference group's influence prevailed. Furthermore, the TotalAccumulated in the treatment group is statistically significantly higher than the control group. This shows that comparison with reference group had a positive effect on the achievement of the participants.

Since intervention in the treatment group has an effect on the outcome of the experiment, the next test is carried out on the variables measuring the comparison and the change in score (hypothesis *H1b*). If the participant was affected by the comparison, the score in the next round of the activity would be significantly different from the previous round. The analysis considers the treatment group of 99 participants however, due to two missing data, 97 data are analyzed for the Trial Round. A Pearson correlation test is run to study the relationship between the two variables namely RefMyTrial and Change1stScore. The assumptions for test are checked: there is linear relationship and both variables are normally distributed as assessed by Shapiro-Wilk's test ($p > 0.05$). There is a statistically significant, moderate negative correlation between RefMyTrial and Change1stScore, $r(95) = -0.382$, $p < 0.01$, with RefMyTrial explaining 14.59% of the variation in Change1stScore.

Negative correlation between RefMyTrial and Change1stScore means that when the participant's score is lower than their referent's score (RefMyTrial is negative), the increase in the next round score will be substantial in comparison with the previous round resulting in a large Change1stScore (as in, FirstScore minus TrialScore is large). On the other hand, when the participant's score is higher than their referent's score (RefMyTrial is positive), the increase in the next round score is small; resulting in a small Change1stScore. The relationship can be illustrated by Figure 1.

Figure 1: Negative Correlation Between RefMyTrial and Change1stScore



Intuitively, when participants found their referents scored higher than themselves, they put in more effort. Conversely, if the participants scored higher than their referents, they did not put in as much effort in the subsequent round. As such, the effect of comparison becomes stronger when the referents have higher scores than the participants.

The same process of test is repeated for RefMyFirst and RefMySecond. The summary of all the test results are shown in Table 3 which lead to conclusion that there is statistically significant linear relationship between the effect of comparison with reference group and the outcome of the experiment. The negative correlation shows that when the participants score worse than their referents, the improvement in score in the subsequent round is greater.

Table 3: Correlation Between Comparison with Referent's Score and Change in Score

Participant's score minus referent's score	Current score minus last round's score	Pearson correlation coefficient, r	Coefficient of determination, r ²	N
RefMyTrial	Change1stScore	-0.382**	0.1459	97
RefMyFirst	Change2ndScore	-0.496**	0.2460	98
RefMySecond	Change3rdScore	-0.399**	0.1592	92

Note: **p < 0.01

Since comparison has effect on the participants, the next step is to test hypothesis *H2a* and *H2b* on the effect of upward comparison and downward comparison. The procedures are the same as the procedure in testing hypothesis *H1b* above. The results are summarized and presented in Table 4. For upward comparison, all the correlations are statistically significant with moderate negative correlation between the comparison of scores with referent's score (RefMyTrial, RefMyFirst, RefMySecond) and the change in scores for two consecutive rounds (Change1stScore, Change2ndScore, Change3rdScore). There is enough evidence not to reject the alternative hypothesis that there is a significant relationship between the upward comparison with reference group effect and the outcome of the experiment for all the three rounds of comparisons.

Table 4: Relationship Between the Comparison with Referents' Scores and the Change in Scores

Comparison	N	Participant's score minus referent's score	This round score minus last round score	Pearson correlation coefficient, r	Coefficient of determination, r ²
Upward comparison	67	RefMyTrial	Change1stScore	-0.415**	0.1722
	66	RefMyFirst	Change2ndScore	-0.468**	0.2190
	64	RefMySecond	Change3rdScore	-0.331**	0.1096
Downward comparison	30	RefMyTrial	Change1stScore	-0.225	0.0506
	30	RefMyFirst	Change2ndScore	-0.525**	0.2756
	27	RefMySecond	Change3rdScore	-0.504**	0.2540

Note: ** p < 0.01

The results for downward comparison are mixed as shown by Table 4. There are statistically significant large negative correlations between RefMyFirst and Change2ndScore, $r(28) = -0.525$, $p = 0.003$ and between RefMySecond and Change3rdRound, $r(25) = -0.504$, $p = 0.007$. However, the negative correlation between RefMyTrial and Change1stScore is not significant statistically, $r(28) = -0.225$, $p = 0.233$. We conclude that there is significant relationship between the downward comparison with reference group effect and the outcome of the experiment for the First Round and Second Round but not for the Trial Round comparison.

Additionally, Table 4 shows majority (~70%) of the participants engaged in upward comparison while minority (~30%) engaged in downward comparison. All the Pearson correlation coefficients are statistically significant except for the Trial Round in the downward comparison situation. These findings show comparison with reference group have effect on the change in scores of the participants in both the upward and downward comparison situations. The effect on downward comparison may have a lag compared with upward comparison probably due to a sense of

superiority (Crocker, Thompson, McGraw, & Ingerman, 1987; Suls & Wheeler, 2012) that the participants initially had. By the following rounds, when the participants accepted that their referents were performing better than their expectations, they increased their effort. This effect may be further researched by using a larger sample with more rounds of repeated challenges. Overall, it can be concluded that comparison with reference group affects the experiment outcome both in the upward and downward comparison situation; upward comparison had a more profound positive effect on the outcome of the experiment than downward comparison.

Lastly, the following section pertains to hypothesis *H3a* and *H3b*. The participants in the treatment group tended to choose the same gender for comparison. As high as 92.9 percent of female participants chose female as their referents while 78.6 percent of male participants chose male as their referents. A Chi-square test of independence is conducted between gender of participants and the gender of the reference group. All expected cell frequencies are greater than five. There is a statistically significant association between the gender of the participants and the gender of their reference, $\chi^2(1) = 51.12$, $p < 0.01$. The association is strong, Cramer's $V = 0.72$ (Cohen, 1988). Therefore, there is enough evidence to reject the null hypothesis; there is a strong association between the gender of the participants and the gender of their reference group.

In terms of ethnicity, 85.1 percent of Bumiputra chose other Bumiputra for comparison, 92.7 percent Chinese chose other Chinese for comparison and 70.0 percent Indian chose another Indian for comparison. As five of the expected cell frequencies are less than five, these are regrouped to Bumiputra and Non-Bumiputra to run a Chi-square test of independence. There is a statistically significant association between the ethnicity of the participants and the ethnicity of their referents, $\chi^2(1) = 55.85$, $p < 0.01$. The association is strong, Cramer's $V = 0.76$ (Cohen, 1988), leading to the conclusion that there is strong association between the ethnicity of the participants and the ethnicity of the reference group.

The above findings answered all the specific hypotheses pertaining to the experiment, confirming the first broad objective of 'comparison with reference group's achievement affects an individual in their own achievement'.

The following section pertains to answering the second broad objective of 'How wealth accumulation is related to comparison with reference group'. This is approached by a multiple regression model. As suggested in 2.1, the total wealth accumulated is related to initial wealth and the effect of comparison with reference group. The modelling of a multiple regression here is to establish a particular causal relationship instead of finding a full list of the various causes of a phenomenon (Moksony, 1990). As such, this regression model focused on the two independent variables of TrialScore (represents initial wealth), and RefMyTrial (represents effect of comparison), as shown in model (1).

$$\text{Predicted TotalAccumulated} = b_0 + b_1\text{TrialScore} + b_2\text{RefMyTrial} \quad (1)$$

All the assumptions of a multiple regression are met; the regression model statistically significantly predicted TotalAccumulated $F(2, 94) = 13.21$, $p < 0.01$, adjusted $R^2 = 0.20$. Regression coefficients are presented in table 5.

Table 5: Result of Regression for the Treatment Group

	Beta (unstandardized coefficient)
Constant	140.089**
Trial Score	1.383**
RefMyTrial	-0.428*
F value	13.205
R ²	0.219
Adjusted R ²	0.203
N	97
Durbin-Watson	2.118
VIF	1.523 (RefMyTrial), 1.523 (TrialScore)
Shapiro-Wilk	p > 0.05

Dependent variable: TotalAccumulated, p* < 0.05, p** < 0.01

Replacing the value of b_0 , b_1 and b_2 with the beta coefficients (two decimal places), model (1) is rewritten as (2) below.

$$\text{Predicted TotalAccumulated} = 140.09 + 1.38\text{TrialScore} - 0.43\text{RefMyTrial} \quad (2)$$

An increase of one unit of TrialScore contributes to 1.38 unit increase in the TotalAccumulated. A change of one unit of RefMyTrial contributes to a change of 0.43 unit in the TotalAccumulated. The change can be either positive or negative depending on the sign of RefMyTrial. As illustrated in Figure 1, when the participant scored higher than their referent, RefMyTrial would be positive and thus the contribution to the TotalAccumulated is negative. Conversely, when the participant scored lower than their referent, RefMyTrial would be negative and the contribution to the TotalAccumulated is positive. This implies the motivation to increase effort is positive when the participants found the referents performed better than themselves. Thus, the second broad objective of this research is achieved.

For regression (2), the overall model is statistically significant with adjusted $R^2 = 0.20$. This means the two independent variables of TrialScore and RefMyTrial explain 20% of the variances in the predicted dependent variable of TotalAccumulated. Since we are not able to find a similar experiment in gauging the reference group effect on wealth accumulation, there is no closer research for comparison. In Nyhus' (2002) study on perceived economic situation compared to others', her finding on "thinking one is better off" is positively correlated with financial wealth ($r = 0.182, p < 0.01$) and total wealth ($r = 0.279, p < 0.01$); with regression models of wealth obtained R^2 of 0.248 and 0.395 respectively. As pointed out earlier, Duesenberry (1949) introduced the concept of comparison with reference group but his mathematical equation on saving ratio did not incorporate this factor. In fact, as far as the research is done, there is no regression model which incorporates a factor of direct comparison between the participants and their referents. As such, this experiment may be considered as ground-breaking in the study of economic behaviour of comparison with reference group where the effect of comparison is captured in the model.

This experiment sets out to study whether viewing the scores of another participant affects the outcome of the experiment. Two important factors to take note here: firstly, 'viewing the scores of another participant' gives the effect of comparison. As 'viewing the scores of another participant'

was the intervention in the experiment, the difference in the outcome between the treatment and control group is attributed to the effect of comparison with the reference group. As such, revealing the difference between the scores obtained by the participants and their referents measures 'relative social standing'. Secondly, the participants were allowed to choose their referents – the participants chose people from the same sex and same ethnicity to be their reference group who would always be in social interaction with them such as colleagues or classmates (Holland, 2010); consistent with the Similarity Theory. Even when Wu, Zhou, van Dijk, Leliveld, and Zhou (2011) studied the effect of social comparison on brain responses by experiment, the participants did not know who their referents were. These two factors are important contributions to the direct study of reference group effect.

The strength of this experiment is that the participants had to physically exert effort, attention and perseverance to complete the activity instead of making decision based on a hypothetical scenario. Of course, no experiment can fully represent the real world, however the intention of the experiment is not on coins digging activity, rather on the effect of the participants being motivated by the relative standing of their referents. The main limitation would be the skill required to take out the coins. In addition, it studied the behaviour of students enrolled in the university programs while young adults who were already working but not in the university programs were excluded from the study. Moreover, the treatment group scoring about 10 coins higher than the control group may not be significant in a practical way. As such, more rounds of challenge with different denominations of coins for future studies should be conducted to assess how long the reference group effect will last, and more data to be collected so that downward comparison effect can be further studied.

6. IMPLICATION AND CONCLUSION

This study shows that comparison with referents' achievement affects the achievement of the participants. Comparison contributes to the TotalAccumulated depending on the relative social standing. As such, 'relative social standing' as a determinant of wealth accumulation is substantiated. The experimental approach in gauging the reference group effect opens a small window in the field of economic psychology where such effect can be gauged directly in a lab experiment instead of measured by self-reporting questionnaire. The Silver Digger Challenge adds a tool to the tool-box of experimental economics and behavioural economics for the studies of individual behaviour. The comparison with reference group had effect on the outcome of the experiment both in upward and downward comparison; however, the positive effect on TotalAccumulated is stronger in the upward comparison situation. The participants engaged reference group who were within their social interaction of the same gender and same ethnicity for comparison.

From the experiment, the participants who were motivated by comparing themselves to their reference group with similar traits, increased their efforts to improve their own achievement of wealth. Educational institutions can benefit from these findings by collecting the data of their alumni (in terms of their age, gender, ethnicity, income, and their current achievement) grouped according to their previous academic achievement to be made available to the current students of the faculty. The breakdown of the grouping must be able to allow the students to find their own

reference group. Students should also constantly be encouraged to make upward comparisons. It is expected that this alumni data can become the reference point to motivate students into improving their achievements. In the long run, this is expected to help improve the overall level of achievement and status of the faculty.

As previously stated, Malaysians lack retirement savings. Another useful area for these findings is in the publication of data of savings and wealth levels in order to prompt Malaysians to save for retirement. Wealth takes time to grow, young people need to cultivate a persistent habit of saving and wealth accumulation to avoid the predicament of insufficient savings. Government should provide data to help the public avoid the bias of availability heuristics when making life long financial decisions (Low, 2012). Availability of data creates awareness for relative social standing. Data of savings and wealth made available to the young people in Malaysia should be age category specific with a narrow 5-years range specific to industry and geographic location. The savings and wealth level published by specific demographic statistics is expected to form the reference category for the young people that allows them to choose their own reference group. It is believed that the availability of such data would be a good benchmark to use as an indicator of achievement or as a motivator to improve their savings and wealth level. At the same time, to further encourage retirement savings, the government may consider higher tax deductibles for schemes such as PRS (private retirement scheme) and EPF. To avoid impacting total retirement savings in the long run, it is important to not reduce EPF contributions in the short term when trying to stimulate consumption during economic downturns.

In conclusion, comparison with reference group motivates people to increase their effort and devote more resources into increasing their wealth. The effect of reference group can be studied directly via a lab experiment with an activity named the Silver Digger Challenge which is a useful tool to study individual economic behaviour. Relative social standing as a determinant of wealth accumulation has implications in policies related to improving retirement savings and wealth accumulation.

ACKNOWLEDGEMENT

The authors thank Mr. Leong Song Seng for the financial support for the experiments in this research as he strongly believes in a good course of advancement of the frontier of knowledge. The first author thanks Mr. Phua Cun Uei for his input on improving the experiment.

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