NUFFIELD CENTRE FOR EXPERIMENTAL SOCIAL SCIENCES

DISCUSSION PAPER SERIES

2010 - 003

Revisiting Michael McBride's Experiment about Money, Happiness and Aspirations

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November 2010

Revisiting Michael McBride's experiment about "Money, happiness, and aspirations"

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November 17, 2010

Abstract: In a laboratory experiment designed to test aspiration-based theories of happiness, McBride (2010) found no evidence of the predicted negative effect of own past payments on subjects' satisfaction with their current round payments. This paper presents further analysis of McBride's data that reveals such an effect. In the treatment where such an effect is most likely to be observed, subjects' satisfaction with their payments in a given round is negatively affected by the level of payment they received the last time they faced the same payment probabilities. The overall trajectory of their payments when facing the same payment probabilities is also found to have an effect.

Keywords: Satisfaction; Happiness; Adaptation; Experiment

JEL classifications: C91; I31

Acknowledgement: I owe a considerable debt of gratitude to Michael McBride, first, for designing and conducting such an inspiring experiment, second, for allowing me to reanalyze his data, and third, for taking the time to engage in a very useful e-mail exchange while I was conducting my analysis and writing this short note.

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1. Introduction

In 2010, Michael McBride presented the results from the first experimental study into how own past payments, the payments received by others, and payment expectations affect subjects' reported satisfaction with current payments. His analysis of the experimental data revealed that, in accordance with aspiration-based theories of happiness, payment expectations and the payments received by others impact negatively on individuals' satisfaction with their own current payments. However, the analysis revealed no evidence that own past payments impact negatively on satisfaction. This null finding is at odds with both aspiration-based theories of happiness and the findings from previous survey-based studies focusing on income. With the aim of reconciling his analysis with the theory and survey-based evidence McBride stated that "subjects are unlikely to become too accustomed to prior payoffs during the duration of a relatively short experiment" (McBride 2010, p.263) and thereby brought the external validity of both his own experiment and any future experiments aiming to investigate aspiration-based theories of happiness and adaptation into question.

In this paper, after summarizing McBride's experimental design (section 2), I develop two conjectures as to why McBride's analysis did not reveal a negative effect of own past payments on satisfaction (section 3). One of these conjectures states that the predicted negative effect is likely to be hard to find in McBride's data, especially in the more complicated treatments. The other states that the negative effect might be present but conditional. Seeing the first conjecture as a justification for further analysis and the testing of the second as a suitable objective for that analysis, I contacted McBride and asked if I could have his data. McBride graciously agreed. The results of this further analysis are presented below (section 4). They show that own past payments do have a negative effect on subjects' satisfaction with their current payments, but only when those past payments were received when facing similar payment probabilities to those currently faced. Further, not only the last payment received when facing similar payment probabilities but also the trajectory of such payments over all prior rounds has an effect.

These new findings have important implications for the way we view McBride's experiment. They suggest that it may have greater external validity than McBride himself concluded; even within the short timeframe of a laboratory-based experiment McBride captured (while leaving a latecomer to render observable) subjects becoming accustomed to levels of and even trajectories in the levels of payments received. These new findings also have important implications for behavioral experiments in general, especially those involving repeated rounds, as they suggest that individual reference points are endogenous to experiences within lab sessions.

2. McBride's experimental design

McBride's experiment involved 25 rounds of a matching pennies game. In each round each subject was randomly matched with one of five computer partner-types: 20 percent heads-80 percent tails; 35 percent heads-65 percent tails; 50 percent heads-50 percent tails; 65 percent heads-35 percent tails; 80 percent heads-20 percent tails. Each partner-type was equally likely.

Each subject was told her partner-type at the start of the round and then had to indicate whether she thought the first, second, third, fourth and fifth of five coins randomly selected by the computer were going to be a head or a tail. Then the computer randomly and independently selected heads or tails according to the partner-type distribution. If the subject's first coin and the computer's first coin matched (either both heads or both tails), the subject won the coin, and so on for the other four coins. Thus, a subject could win between zero to 5 coins in any given round. Once all the choices and draws were complete, the subject learned the number of coins won by her in the round. In Treatment A, the subject was told only the number of coins won by her in the round. In Treatment B, the subject was told both the number of coins won by her and the average number of coins won by other subjects in the round. In Treatment C, the subject was told the number of coins won by her, the average number of coins won by other subjects facing the 20-80 partner-types, the average number of coins won by other subjects facing the 35-60 partner-types, and the average number of coins won by other subjects facing the 50-50 partner-type. Immediately after this, the subject was asked "How satisfied are you with the result of this round?" She then reported her satisfaction on a scale of 1-7, with 1 signifying "very dissatisfied," 4 signifying "satisfied," and 7 signifying "very satisfied." Then, the next round began.

Treatments A, B, and C were assigned to 36, 32, and 36 subjects, respectively. Payments were calculated using an exchange rate of 8 coins for 1 dollar. Sessions lasted approximately 1 hour and the average total take-home pay was approximately $17.

3. Why no evidence of a negative effect of past own payments on satisfaction with current round payment?

First, consider the sequence of events leading up to and including the elicitation of the subjects' level of satisfaction in each round. In Treatment A, the subjects found out their computer partner-type and hence, in principle, the objective expected payment for the round. Then they made their choices and found out their own payment for the round. Finally they reported their level of satisfaction. Note that information about all of their own past payments was received prior to this entire sequence of events.[1] So, if when constructing a reference point or aspiration an individual gives more weight to information received more recently, we would expect own past payments to be given less weight than the objective expectation and current own payment. In Treatment B, another piece of information, namely the average payment to others for the round, was received at the same time as they found out their own payment for the round, possibly reducing the weight assigned to information about own past payments relative to Treatment A. Finally, in Treatment C, three other pieces of information, namely the average payment to others facing each of the three possible sets of payment probabilities, was received at the same time as they found out their own payment for the round, possibly reducing the weight

[1] All of their own past payments were either visible on the computer screen or, in the case of much earlier rounds, could be made visible by scrolling. However, this data accumulated on the screen rather than being re-received prior to the reporting of satisfaction with any given round.

assigned to information about own past payments even further. This reasoning leads to the following conjecture:

Conjecture 1: the sequencing of events in the experiment may have reduced the likelihood of identifying a negative effect of own past payments on satisfaction with current payment, especially in Treatments B and C.

This conjecture cannot be tested using McBride's data. However, it can be viewed as a justification for undertaking further analysis of McBride's data. Further, in principle at least, the differential likelihood of finding the effect across treatments can be explored.

Second, McBride found that in Treatment C a subject's satisfaction with her own current payment was negatively affected by the average payment received by others facing the same partner-type, i.e., the same payment probabilities, and *not* by the average payment received by others facing different partner-types. However, McBride did not investigate whether a similar type of conditioning was applied to own past payments. Thus, it seems reasonable to investigate the following conjecture:

Conjecture 2: subjects' satisfaction with their own current payments is negatively affected by their own past payments when facing the same partner-type.

In the next section I present the results of a test of Conjecture 2 based on the data from McBride's Treatment A. Then I consider Conjecture 1 by reporting what happens when the analysis is extended to Treatments B and C.

4. Results

Column 1 of Table 1 presents a linear regression analysis conducted and presented by McBride.[2] This regression focuses on Treatment A only. It takes the subject's level of satisfaction with the round as the dependent variable and the round number (*Round*), the subject's payment (in coins won) for that round (*Payment*), the expected payment for a subject making the expected payment maximizing choices in that round (*Exp. payment-max*), the subject's payment (in coins won) in the previous round (*Prior round payment*), and the subject's average payment (in coins won) across all prior rounds (*Avg. payment through prior rounds*) as independent variables. There are 24 observations, one corresponding to each round in the experiment excluding the first, for each of the 36 subjects giving a total of 864. The regression accounts for subject fixed effects. Note the insignificant coefficients on *Prior round payment* and *Avg. payment through prior rounds*.

In column 2 *Prior round payment* and *Avg. payment through prior rounds* are replaced with the payment the subject received when she last faced the same partner-type, i.e., the same payment probabilities (*Payment in last round with same type*).[3] This new variable bears a

[2] See McBride (2010) page 270, Table 2, column "II-A" (the fourth column of figures).
[3] The mean for this new variable is 3.262 and its standard deviation is 1.142.

negative coefficient that is significant at the 5 percent level.[4] The coefficient is small; for every additional coin they won during their last meeting with the same partner-type their satisfaction with their current win is only 0.065 points lower. It is less than one fifth of the size of the effect of the objective expectation. However, the effect is identified and it is well defined.

Table 1
Linear regression analyses of McBride's data
Dependent variable = level of satisfaction with round

	1	**2**	**3**
Constant	1.325 ***	1.335 ***	1.237 **
	(0.468)	(0.420)	(0.464)
Round	-0.011 *	-0.011	-0.013
	(0.006)	(0.007)	(0.010)
Payment	1.420 ***	1.388 ***	1.315 ***
	(0.083)	(0.093)	(0.116)
Exp. payment-max	-0.482 ***	-0.381 ***	-0.339 ***
	(0.100)	(0.102)	(0.124)
Prior round payment	0.0003		
	(0.038)		
Avg. payment through prior rounds	0.017		
	(0.034)		
Payment in last round with same type		-0.065 **	
		(0.026)	
Decline in payment between last round with same type and current round			-0.071 *
			(0.041)
Trajectory across rounds with same type			-0.129
			(0.096)
Decline x Trajectory			-0.118 ***
			(0.043)
R-squared (overall)	0.68	0.67	0.65
R-squared (within)	0.75	0.73	0.74
Observations	864	721	546

Notes: Data generated experimentally by McBride (2010); standard errors reported in parentheses are adjusted to account for correlation within individuals; subject fixed effects are included in all regressions; sample for regression in column 1 omits the first round of the experiment; sample for regression in columns 2 and 3 also omits cases where subject is meeting a specific partner-type for the first time; sample for regression in column 3 also omits cases where subject is meeting a specific partner-type for the second time; * - significant at 10 percent level; ** - significant at 5 percent level; *** - significant at 1 percent level.

In column 3 I push the analysis a step further by replacing *Payment in last round with same type* with *Decline in payment between last round with same type and current round*, *Trajectory across previous rounds with same type*, and the interaction between these two variables. The variable *Decline in payment between last round with same type and current round* (the *Decline*

[4] Note that this regression was run on a smaller sample than McBride's regression in column 1. This is because, in earlier rounds especially, not all subjects had had a prior meeting with the same partner-type. If McBride's specification is run on this restricted sample almost identical (to McBride's) results are returned. In particular, neither *Prior round payment* nor *Avg. payment through prior rounds* bears a significant coefficient.

variable) equals the payment that a subject received the last time they faced the partner-type they are facing again in the current round minus the payment they receive for the current round.[5] *Trajectory across previous rounds with same type* (the *Trajectory* variable) is the estimated slope coefficient from a linear regression that takes a subject's payoffs in all previous rounds in which they faced the same partner-type, i.e., the same payment probabilities, as the dependent variable and the round number as the only right-hand side variable. A total of 2,726 such regressions were run. Approximately 30 percent of these regressions were conducted on two observations and, so, were not strictly regressions even though they yielded slope coefficients. The estimated coefficients varied between minus two and plus five.[6] Only 10.7 percent of the coefficients were significantly different from zero at the 10 percent level.[7]

The inclusion of the *Trajectory* variable and its interaction with the *Decline* variable represents a departure from standard aspiration-based theories of happiness. It allows us to look at whether individual reference points are conditioned not only on levels in past experiences but also on the dynamics or trajectories of those past experiences. Consider, for example, two individuals who receive the same incomes as each other in times t and $t+1$, with the income in $t+1$ being lower than the income in t. These two individuals are identical in all respects except that for one the fall represents a continuation of an ongoing decline in income, while for the other it follows the end of a period of income growth. According to standard aspiration-based theories of happiness, if both individuals had adapted to their income level in t, they would both be equally unhappy with the fall in income in $t+1$. Further, if they had not fully adapted to their income level in t, the individual whose income was growing just prior to t would be *less* unhappy as the fall would be more likely to represent a return to a recently experienced level of income. However, if individual aspirations are more like projections along the current trend than projections assuming stasis, the individual whose income was growing just prior to t would be *more* unhappy as the fall would lead to a greater divergence between aspiration and reality. To study such a phenomenon using survey data would require a panel of greater length than is currently available. However, McBride's data spans 25 time periods, thereby providing a unique opportunity to look at the impact of past trajectories on aspiration formation.

In column 3 the coefficient on the *Trajectory* variable is not significant.[8] However, the interaction between the *Trajectory* and the *Decline* variable bears a negative coefficient that is significant at the 1 percent level. The coefficient on the uninteracted *Decline* variable is also

[5] Note that a model that included only *Decline in payment between last round with same type and current round* in place of *Payment in last round with same type* would be structurally equivalent to the model in column 2. When such a model is estimated the *Decline* variable bears a significant negative coefficient.

[6] The mean was 0.012 and the standard deviation across the sample of 2,726 slopes was 0.464.

[7] Of course, such a regression can only be run if a subject has met the partner-type she now faces twice before and this restricts the sample and causes later rounds to be overrepresented even more. If the specification presented in column 2 is run on this even more severely restricted sample the coefficient on *Payment in last round with same type* changes to -0.092 but remains significant at 5 percent. If McBride's specification is run on this even more restricted sample, once again, neither *Prior round payment* nor *Avg. payment through prior rounds* bears a significant coefficient.

[8] When the *Trajectory* variable is included and the *Decline* variable and interaction term are not, the *Trajectory* variable bears a significant (at 5 percent) negative coefficient.

negative and significant at the 10 percent level. Taken together, the two significant coefficients indicate that the dissatisfaction associated with a decline in payment across consecutive meetings with the same partner-type in McBride's experiment is greater the more *upwardly* inclined the trajectory of payments over all prior meetings with that partner-type.

To assist with the interpretation of these coefficients, Figure 1. presents four possible scenarios that a subject could have experienced leading up to a win of 3 coins in round 12 of the experiment (left-hand panel) and the subject's satisfaction with that win of 3 coins (right-hand panel) predicted using the model presented in column 3 of Table 1. The scenario involving an increase in payment over prior rounds when facing the same type up to round 11 and then a decline between round 11 and round 12 (Scenario 4: increase-and-then-decline-to-3-coins) yields an observably and, according to an F-test, significantly lower level of satisfaction compared to the scenarios in which the subject experiences an increase in payment between rounds 11 and 12 (Scenario 1: decline-and-then-increase-to-3-coins, and Scenario 2: carry-on-increasing-to-3-coins) or a continued decline (Scenario 3: carry-on-declining-to-3-coins). The difference in satisfaction level between Scenario 4, increase-and-then-decline-to-3-coins, and the other scenarios is one quarter of a point on the seven point scale, smaller but similar in order of magnitude to the effect of a one coin decline in the objective expectation (-0.339 in the same model). Thus, McBride's data reveals that when constructing their payment aspirations experimental subjects adapt not only to recently experienced payment levels but also to payment trajectories.

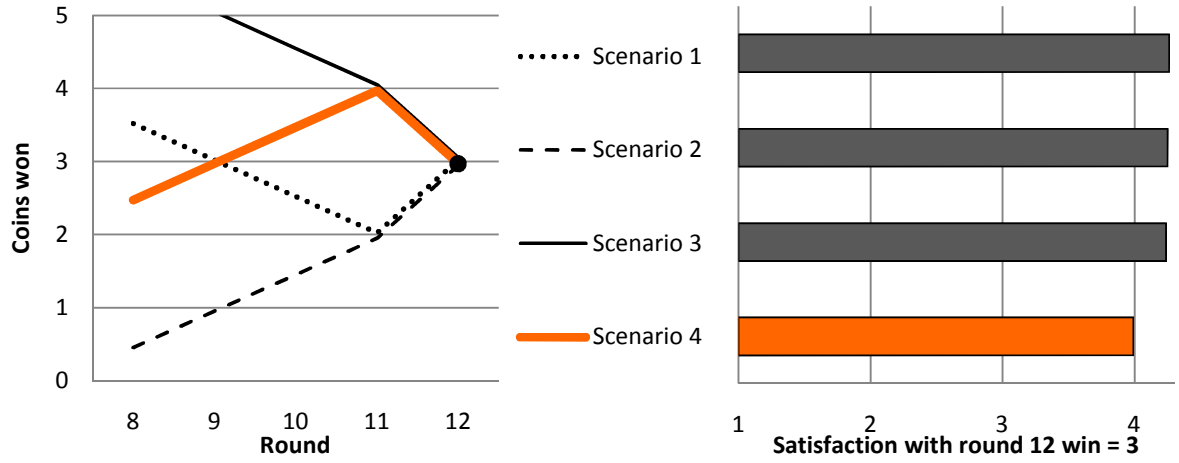

Fig. 1. Predicted effects of different payment trajectories on subject satisfaction with current round payment

Notes: In the text: Scenario 1 is also referred to as the decline-and-then-increase-to-3-coins scenario; Scenario 2 as the carry-on-increasing-to-3-coins scenario; Scenario 3 as the carry-on-declining-to-3-coins scenario: and Scenario 4 as the increase-and-then-decline-to-3-coins scenario.

In the analysis of the data from McBride's Treatments B and C, when either *Payment in last round with same type* or the *Decline* variable, *Trajectory* variable, and the interaction between

the two is used in place of *Prior round payment* and *Avg. payment through prior rounds*, they all bear insignificant coefficients (see Table 2). This is consistent with Conjecture 1 above.

Table 2
Linear regression analyses of McBride's Treatment B and Treatment C data
Dependent variable = level of satisfaction with round

	Treatment B			Treatment C		
	1	2	3	4	5	6
Constant	1.379 ***	1.697 ***	1.822 ***	0.311	0.122	0.541
	(0.437)	(0.489)	(0.546)	(0.772)	(0.816)	(0.934)
Round	0.001	0.001	0.007	-0.009	-0.007	0.000
	(0.009)	(0.009)	(0.008)	(0.007)	(0.007)	(0.011)
Payment	1.540 ***	1.516 ***	1.495 ***	1.525 ***	1.543 ***	1.532 ***
	(0.055)	(0.060)	(0.059)	(0.076)	(0.063)	(0.061)
Exp. payment-max	-0.387 ***	-0.348 ***	-0.433 ***	-0.155	-0.247 **	-0.281 **
	(0.079)	(0.083)	(0.098)	(0.098)	(0.107)	(0.135)
Overall average of others	-0.342 **	-0.321 **	-0.298 *			
	(0.128)	(0.128)	(0.154)			
Own type average				-0.179 **	-0.155 *	-0.053
				(0.076)	(0.080)	(0.110)
Avg. of other type averages				0.034	0.154	-0.056
				(0.204)	(0.253)	(0.266)
Prior round payment	0.067 **			0.051 *		
	(0.024)			(0.026)		
Avg. payment through prior rounds	0.061			0.001		
	(0.037)			(0.044)		
Payment in last round with same type		-0.021			0.016	
		(0.031)			(0.029)	
Decline between last round with same type and current round			-0.017			-0.007
			(0.031)			(0.033)
Trajectory across rounds with same type			-0.122			0.008
			(0.102)			(0.107)
Decline x Trajectory			0.036			0.082
			(0.079)			(0.080)
Observations	768	641	488	864	720	540

Notes: Data generated experimentally by Michael McBride, regressions in columns 1 and 4 are as presented in McBride (2010); standard errors reported in parentheses are adjusted to account for correlation within individuals; subject fixed effects are included in all regressions; sample for regression in columns 1 and 4 omit the first round of the respective experimental sessions; samples for regressions in columns 2, 3, 5, and 6 also omit cases where subject is meeting a specific partner type for the first time; sample for regressions in columns 3 and 6 also omit cases where subject is meeting a specific partner type for the second time; * - significant at 10 percent level; ** - significant at 5 percent level; *** - significant at 1 percent level.

5. Discussion

That within McBride's experiment, own past payments when facing the same partner-type negatively affect satisfaction with current own payment indicates that experimental subjects do become accustomed to prior payoffs even within one-hour-long laboratory experiments. Thus, it seems that McBride's experiment may have greater external validity than McBride himself concluded.

However, it is important to bear in mind that, like the social comparison effect identified in McBride's original analysis, the hedonic treadmill effect revealed here relates only to experiences when facing the same payment probabilities. In the case of the social comparison effect, this does not appear strange as it corresponds quite nicely to the finding in the survey-based literature that people compare themselves to similar others (variably defined). That the hedonic treadmill effect might be conditioned on the similarity between the current and past own contexts does not correspond in the same way to a finding in the survey-based literature. However, given how early we are in the analysis of this phenomenon, it would seem inappropriate to treat this as evidence of external invalidity. Rather, it should be viewed as a motivator for further research both within and outside the lab.

Finally, it is also important to bear in mind that the predicted negative effect of own past payments was observed in only one of the three treatments applied by McBride. This differential effect also needs further investigation as it suggests that even apparently trivial details of experimental design could affect the conclusions drawn.

References

McBride, Michael. 2010. Money, happiness, and aspirations: An experimental study. Journal of Economic Behavior and Organization 74, 262-276.