Cognitive Dissonance, Pessimism, and Behavioral Spillover Effects

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Abstract

A two-stage experiment was designed to examine spillover effects of a type of optimism/pessimism. We first induce optimism/pessimism by random assignment of high/low piece rates for performing a task. Subjects receiving the low piece rate are significantly more pessimistic with respect to performance. In stage 2 individuals participate in an ultimatum game. Pessimistic subjects have significantly lower minimum acceptable offers, though pessimism was randomly generated in an unrelated environment. These results reveal behaviorally and economically important spillover effects --for example, pessimism regarding one’s initial conditions (e.g., living in poverty) may have spillover effects on one’s future labor market outcomes.

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1. MOTIVATION

Individuals’ expectations play an important role in most decision environments. As such, the presence of any bias in subjective expectations can affect many economic outcomes. Two of the most common types of biases affecting expectations (and hence outcomes) are the tendencies towards optimism or pessimism in individuals’ beliefs and attitudes. Optimism or “over-confidence”, for example, can take on many forms (see Babcock and Loewenstein, 1997; Rabin, 1998). Overconfidence may increase the likelihood of dispute in a bargaining environment (Babcock and Loewenstein, 1997; Dickinson, 2006), affect the manner in which individuals make financial decisions (Barber and Odean, 2001; Odean, 1998), or increase the likelihood of careless decisions if the over-confidence is with respect to one’s driving skills (Svenson, 1981) or one’s health (Weinstein, 1980). Though some psychology research explores pessimism (e.g., in depressed individuals: see Pyszczynski et al., 1987), much of the research in both psychology and economics has focused on optimism and self-serving beliefs.¹ Experimentally, Heolzl and Rustichini (2005) studied the effect of optimism in one’s relative ability in a skill task. While individuals are optimistic with respect to their own abilities in their study, results suggest that pessimism is more prevalent when facing more difficult tasks, especially when money is at stake.

This present paper examines expectations in a unique environment in which we explore first how a type of optimism or pessimism can be induced and, secondly, how these induced beliefs in one area can affect behavioral outcomes in another unrelated environment. To avoid confusion with the numerous uses of the terms optimism/pessimism, we specifically consider an individual’s beliefs about her own abilities on a cognitive task—namely, a letter-ordering task. We find that optimism or pessimism can be induced via the ex post random assignment of a high

¹ It is important to note than in many circumstances overconfidence in one domain often imply pessimism in another: overconfidence in the information one receives (as in Rabin and Schrag, 1999) or in the advice received from others (as in Rabin, 2002) implies pessimism regarding one’s own private information and relative abilities.
or low piece rate wage for performing this cognitive task. We observe significantly more pessimism (i.e., expected output less than actual output) among subjects who are randomly assigned a low piece rate wage. The opposite occurs (i.e., optimism) for subjects paid the high piece rate wage. Our ability to induce optimism or pessimism in this environment can be explained by theories of cognitive dissonance (e.g., Aronson 1992), where the generation of an optimistic or pessimistic belief can reduce an inherent conflict between cognitions. We then conduct a second stage experiment in which these same subjects engage in a simple, yet unrelated, bargaining (ultimatum) game.

Our results highlight two important conclusions: First, consistent with cognitive dissonance theory, we are able to induce a specific type of optimism/pessimism with the initial random wage assignment. This implies that we can successfully manipulate an important psychological construct in the lab, at least at a micro-level. Secondly, subjects who received this low piece rate were willing to accept lower offers in a second-stage ultimatum game. This finding is striking, demonstrating that random shocks to a component of one’s psychological capital can lead to spillover effects onto behavioral outcomes in an entirely unrelated experimental environment. This supports other research demonstrating how motivations developed in one decision environment (e.g., rationality, altruism) can spillover and affect decisions in other environments (Cherry et al, 2003; Cherry and Shogren, 2007). However, this paper is the first, to our knowledge, to demonstrate such a spillover effect caused by a random shock in such a fundamentally distinct arena (i.e., individual task versus bargaining outcomes).

There is increasing evidence in the psychology literature that one’s beliefs regarding future outcomes (so-called “dispositional optimism-pessimism”) are a dimension of personality that affects life-choices and outcomes (Heinonen, et al., 2005). The important implication is that
optimism/pessimism in one environment may not be independent from optimism/pessimism in another. For example, if dispositional pessimism at one point in time can significantly predict one’s tendency to be passive or withdraw effort (Scheier and Carver, 1985), and if such a disposition is persistent and stable, then an event that affects one’s disposition will have spillover effects with potentially important economic consequences (e.g., job search, bargaining behavior, investment choice, etc.). For example, Goldsmith et al (1997) shows that one’s “psychological capital” significantly affects labor market earnings. Specifically, an investment in one’s psychological capital is estimated to increase wages by even more than a comparable investment in human capital. Thus, whatever initially contributes to an individual’s stock of psychological capital has important spillovers into measurable labor market outcomes.

The presence of dispositional optimism and pessimism can be directly related to emotions and self-esteem. For example, a recent review in psychology concludes that positive emotions are a causal factor in successful life outcomes of various sorts (Lyubomirky and King, 2005). While separable from positive emotion or affect, Lucas et al. (1996) find that optimism is nevertheless related to positive affect. This result is consistent with those of Charness and Levin (2005) who find that “emotional reinforcement” induced by payment can explain deviations from Bayesian updating. From the standpoint of Lucas et al. (1996), this suggests that the affect created by emotional reinforcement affects the optimism and pessimism that individuals may have in their decisions, thus leading to non-Bayesian behaviors. Generalizing, this literature suggests that optimism and pessimism may play causal roles in many outcomes that have significant longitudinal effects, such as work absenteeism, marital well-being, charitable giving, and judgment accuracy, among others (see Lyunbomirky and King, 2005). Our results suggest
that these effects may arise even in cases where the pessimism was generated in an unrelated environment, thus supporting the notion that pessimism can be insidious.

Psychologists argue that certain events or environments can ascribe self-esteem (Lane, 1991; Glietman, 1991), which relates to dispositional optimism/pessimism. Self-esteem and dispositional optimism/pessimism are considered clear contributors to one’s outlook and outcomes in life (Scheier and Carver, 1985; Lyunbomirky and King, 2005). Indeed, the effect of optimism on one’s outlook on life may explain the effects reported in Gardner and Oswald (2007): individuals who won medium size lotteries report significantly better psychological health than do non-winners. This effect persists for at least two years after the time of their lottery win. This suggests that the effects of shocks to optimism/pessimism can have important welfare and outcome effects by altering decision-making across environments, offering some field evidence in support of our laboratory results. Here, we recreate a useful microcosm of this relationship in a simple lab environment where beliefs spill over into separate but meaningful behavioral differences that can have economically significant consequences.

2. EXPERIMENTS

Our experiments are designed to first manipulate optimism and pessimism, after which we examine the associated spillover effects of randomly assigning these beliefs in a simple bargaining context (i.e., the ultimatum game).

Experiment 1

In experiment 1, participants took part in a grammatical reasoning task (i.e., a modified version of the task in Baddeley, 1968). In this task, participants were given a short sentence describing the ordering of either three or four alphabetic letters. These sentences were displayed
individually for three seconds, with five seconds between each sentence. After observing a sentence for three seconds, participants wrote down the proper ordering of the letters as described in the sentence. For example, if an individual encountered the sentence "A is followed by D is followed by B is preceded by C" she would have to write down CADB to have correctly ordered the letters in accord with the sentence. Similarly, if the participant encountered the sentence "Z does not proceed X does not follow Y," she would have to write down XZY to have correctly ordered the letters.\(^2\) A total of 64 letter ordering sentences were displayed to participants.

Prior to undertaking the task, participants were informed of the incentives they faced in the experiment. Specifically, participants were informed that they would either be paid $0.25 or $1.25 for each correct letter ordering on their answer sheet and that the piece rate would only be revealed after the task was completed. Participants were informed (in both the written and onscreen instructions) that the applicable piece rate would be randomly selected by the computer after the letter ordering task was completed. Thus, participants did not know which piece rate applied at the time they undertook the task.

After the grammatical reasoning portion of the experiment, participants’ answer sheets were collected by the experimenter and participants were informed regarding which piece rate would apply (i.e., $0.25 or $1.25). After learning which rate applied, participants were asked two questions. First, participants were asked to indicate a scale of 1 to 10 how much they enjoyed the task. Secondly, participants were asked to estimate the number of questions they answered correctly, receiving an additional $5 payment if their estimate was correct and an additional $3

\(^2\) Instructions describing the rules to be used when ordering letters provided in the appendix and are such that there is a unique letter-ordering to each sentence when using the rule given to subjects. The displaying of sentences and the enjoyment and expectations questions were programmed using z-Tree (Fischbacher, 2007). Participants responses to the sentences were written down on an answer sheet provided by experimenter and scored manually.
payment if their estimate was within two of the actual number of correct answers. Our choice of task for experiment 1 was motivated by our desire for a skill-based (i.e., cognitive ability) task with a simple outcome measure. The choice of a mundane task limits the extent to which there is any home-grown intrinsic motivation that might confound our piece-rate manipulation effect.

**Hypotheses**

With regard to experiment 1, we put forth two hypotheses. First, with respect to the task enjoyment question, we hypothesize that individuals receiving the lower piece rate (i.e. $0.25) will report higher levels of enjoyment than those receiving the higher piece rate (i.e. $1.25). This follows the previous literature on cognitive dissonance (e.g., Aronson, 1992, 1994; Festinger, 1957) and particularly the experiments of Festinger and Carlsmith (1959). Namely, this literature has shown that one way in which individuals can reduce the dissonance (emotional discomfort) between having worked hard and getting paid little is to rationalize that they really enjoyed the task more (thus the hard work). In Festinger and Carlsmith (1959) subjects participating in a mundane task were paid either $1 or $20 to claim to another individual that a task was enjoyable. Surprisingly, individuals who were paid less for intimating the task as enjoyable reported greater levels of task enjoyment.  

According to the theory of cognitive dissonance, individuals who were paid less were in a greater state of dissonance (i.e., conflict between the cognitions “I was paid $1 to tell someone the task was interesting,” and “I found the task boring.”) and hence reduced dissonance by altering their perceived enjoyment of the task;

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3 A recently publicized article (Tierney, 2008) has highlighted M. Keith Chen’s criticism of a flawed mechanism behind some of the original cognitive dissonance experiments in psychology. While we note such critiques, which have been addressed by psychologists, we also point out that the type of cognitive dissonance we exploit for our experiment 1 manipulations are *not* the type at issue in these recent criticisms.
individuals receiving $20 had less dissonance as the compensation provided a rationale for communicating the task was enjoyable.⁴

Cognitive dissonance theory states that an individual experiences dissonance whenever her actions and cognitions are in conflict, and will seek to reduce the dissonance. In some instances, it may prove easier to change one’s cognitions (e.g., enjoyment of a mundane task) than to change one’s actions. In our experiments, participants will be left with two cognitions after completing the task: 1) “I engaged in a boring task” (here, ordering letter sequences), and 2) “I was paid $X for engaging in the task.” In our experiments, participants receiving the high piece rate have an extrinsic reason for having exerted effort or participated in the task. These individuals are therefore less likely to experience dissonance in the experiment. On the other hand, those participants who received the low piece rate have a much weaker extrinsic reason for having participated. As such, these individuals are in a state of dissonance and look for an intrinsic rationalization for having participated, namely greater enjoyment of the task. Hence we have the following:

**H1.1** Individuals who learn (ex post) that they have received the lower piece rate will express higher levels of enjoyment for the task than did those who received the higher piece rate.

Our second hypothesis focuses on individuals’ expectations regarding performance—whether they are optimistic or pessimistic regarding how they perform on this task is an additional cognition that we seek to highlight and exploit in our experimental manipulation. Based on the logic above, individuals who receive the low piece rate are in a state of dissonance relative to those who received the higher piece rate. In addition to reducing dissonance via greater subjective task enjoyment, individuals may also reduce dissonance by adjusting beliefs

⁴Similar effects are documented in Aronson and Carlsmith (1963), Aronson and Mills (1959), Axsom and Cooper (1985), and Cooper and Worchel (1970). For a review of the theory of cognitive dissonance (and the various theories falling under its umbrella), see Aronson (1992) and the subsequent commentaries.
regarding their ability in the task. Given the conflict between the cognitions described above, Beauvois and Joule (1996) argue that incorporating additional cognitions (as opposed to changing cognitions) is a mechanism to reduce dissonance.\(^5\) Within this framework, an individual may incorporate cognitions related to her ability to reduce dissonance, thereby providing additional rationalization for the effort they exerted in the task.

With respect to our experiment, individuals receiving the low piece rate are in a state of dissonance given the conflict between the cognitions “I exerted effort to earn a large sum of money,” and “I received the low piece rate.” Adopting a pessimistic belief with respect to one’s abilities on the task would reduce the dissonance created by having exerted effort only to receive a low return (i.e., low piece rate). On the other hand, individuals who received a high piece rate do not experience the same character of dissonance. As a result, these individuals are less likely to be pessimistic (or perhaps more likely to be unbiased or optimistic) regarding their performance on the task. Thus, we have the following hypotheses:

**H1.2** Individuals who learn (ex post) that they have received the lower piece rate will be pessimistic with respect to their abilities on the task.

**H1.3** Individuals who learn (ex post) that they have received the high piece rate will be optimistic with respect to their abilities on the task.

**Results**

Table 1 presents the average scores and expectations for participants receiving the high ($1.25) and low ($0.25) piece rates. We identify no differences between the distribution of scores across piece rates (Kolmogorov-Smirnov (K-S) test for equality of distributions \(p=0.913\)) or the distribution of expected scores across piece rates (K-S \(p=0.946\)). However, in line with

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\(^5\) This approach is based on the idea of a “dissonance ratio” measured as the number of dissonant cognitions divided by the sum of dissonant and consonant cognitions. This formulation was originally suggested by Festinger (1957) and is advocated by Beauvois and Joule (1996).
theories and experiments in cognitive dissonance, we do identify a difference between the
distributions of subjective task enjoyment (rated on a scale from 1 to 10) across participants
receiving different piece rates (K-S $p=0.027$). This validates our experimental manipulation as
fostering dissonance in participants who receive the low pay rate. These individuals reduced
dissonance by (retrospectively) enjoying the task more.

<table>
<thead>
<tr>
<th>Piece Rate</th>
<th>Score</th>
<th>Expected Score</th>
<th>Enjoyment</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.25$ (n=39)</td>
<td>39.67 (16.95)</td>
<td>41.36 (15.66)</td>
<td>4.62 (2.33)</td>
</tr>
<tr>
<td>$0.25$ (n=50)</td>
<td>41.96 (16.21)</td>
<td>40.60 (16.86)</td>
<td>5.66 (2.61)</td>
</tr>
</tbody>
</table>

Table 1: Mean (st. dev.) of scores, expectations, and subjective enjoyment in Experiment 1.

To measure optimism and pessimism with respect to this task, we calculate the difference
between a participant’s expected and actual score. This difference is positive for optimistic
participants and negative for pessimistic participants. Figure 1 presents the distributions of these
differences by piece rate. For those participants receiving the high piece rate the mean difference
is $1.69 (\sigma = 11.47)$; for those participants receiving the low piece rate the mean difference is
$-1.36 (\sigma = 11.61)$. A Kolmogorov-Smirnov test for equality of distributions rejects the
hypothesis that the samples are drawn from the same distribution ($p = 0.044$), indicating that
participants receiving the higher (lower) piece rate were more optimistic (pessimistic).
Experiment 2

In our second experiment we explore the spillover effects of induced optimism/pessimism on economic behavior in a simple bargaining setting. As before, individuals completed the grammatical reasoning task prior to knowing their actual piece rate. Upon learning their piece rate (but prior to knowing their actual score) individuals were asked to guess their score and were paid as above. Again, we utilize the difference between expected score and actual score as a measure of optimism or pessimism with respect to one’s own ability on the cognitive task.
In experiment 2 individuals participated in the grammatical reasoning experiment described above. Following the grammatical reasoning stage, individuals then participated in a simple $10 ultimatum game using the strategy method as employed by Oxoby and McLeish (2004) in which the ultimatum game is portrayed as an extensive form game in which (i) nature chooses each player's role, (ii) the proposer chooses her offer and (iii) the responder accepts or rejects. In the context of our experiment, individuals were described the ultimatum game (in the initial instructions) and were asked to enter an offer (to be implemented were they assigned the role of proposer) and enter accept/reject decisions for each possible offer they could receive (to be implemented if assigned the role of responder). This enables us to calculate for each participant an offer and a minimum acceptable offer.

After all participants entered this information, individuals were paired and randomly assigned the role of either proposer or responder. Given these assignments, the respective offer and accept/reject decisions were implemented. Note that in the ultimatum game portion of the experiment participants were randomly paired and did not know the piece rate that had been paid to the individual with whom they were matched. As such, individuals (if they were conscious of the effect of piece rates on beliefs) did not know whether they were matched with an optimistic or pessimistic subject. Payoffs from the grammatical reasoning and the ultimatum game stages of experiment were paid privately at the end of experiment. It is important to again highlight the fact the high/low piece rates were assigned randomly, and this was common knowledge to the subjects. This minimizes the concern that our experiment 2 results are spurious or suffer from an omitted variables bias. That is, randomly-induced optimism/pessimism limits the likelihood that

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6 Previous research has demonstrated that this method of eliciting decisions in the ultimatum game does not affect the character of play in the ultimatum game. See Oxoby and McLeish (2004) for a discussion of this literature.
unmeasured subject-specific heterogeneities in bargaining (e.g., preferences for fairness, tastes for revenge) are correlated to our measure of optimism/pessimism.

**Hypotheses**

We put forth two hypotheses regarding the effects of optimism and pessimism (i.e., the type we examine) in ultimatum bargaining. Within an ultimatum game optimism or pessimism may have natural effects on the manner in which individuals bargain. For example, optimistic individuals may be more aggressive when extending offers or reporting minimum acceptable offers; pessimistic individuals may view the bargaining process in a negative light, with futility, or may feel that they deserve less, and thereby be willing to accept lower offers.

Our first hypothesis is in regards to the effect of optimism or pessimism on offers in the ultimatum game.

**H2.1** Optimistic (pessimistic) individuals extend lower (higher) offers in the ultimatum game.

This hypothesis follows previous experiments exploring the effects of affective state on economic decision making (e.g., Capra, 2004; Hillman et al, 2004; McLeish and Oxoby, 2007). Similarly, with respect to minimum acceptable offers (MAO) we expect pessimistic individuals to be willing to accept lower offers.

**H2.2** Pessimistic (optimistic) individuals will put forth lower (higher) minimum acceptable offers in the ultimatum game.

**Results**

Table 2 presents the summary statistics from Experiment 2. As in Experiment 1, we find no differences in performance on the grammatical reasoning task or expectations across piece rates (K-S $p>0.70$ for each). However, we do identify differences in the distribution of optimism/pessimism as measured by the differences between expected and actual performance
<table>
<thead>
<tr>
<th></th>
<th>Score</th>
<th>Expected Score</th>
<th>Enjoyment</th>
<th>Offer</th>
<th>MAO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>$1.25 Piece Rate</strong>&lt;br&gt; (n=44)</td>
<td>37.71</td>
<td>41.73</td>
<td>5.10</td>
<td>4.43</td>
<td>3.34</td>
</tr>
<tr>
<td></td>
<td>(17.11)</td>
<td>(18.37)</td>
<td>(2.25)</td>
<td>(1.09)</td>
<td>(1.35)</td>
</tr>
<tr>
<td><strong>$0.25 Piece Rate</strong>&lt;br&gt; (n=42)</td>
<td>40.27</td>
<td>40.09</td>
<td>5.84</td>
<td>4.45</td>
<td>2.59</td>
</tr>
<tr>
<td></td>
<td>(15.46)</td>
<td>(15.43)</td>
<td>(1.98)</td>
<td>(0.95)</td>
<td>(1.55)</td>
</tr>
</tbody>
</table>

Table 2: Summary statistics for Experiment 2.

![Figure 2: Distributions of optimism/pessimism (i.e., difference between score and expected score) by piece rate in Experiment 2.](image)

(see Figure 2): Kolmogorov-Smirnov $p=0.011$ between those receiving the high piece rate (mean 4.03, $\sigma = 9.78$) and those receiving the low piece rate (mean -0.18, $\sigma = 12.15$) suggesting results comparable with the results of our experiment 1. Also, as in experiment 1, we identify
differences between the distributions of elicited enjoyment across piece rates differ (K-S $p=0.041$), in the direction predicted by the cognitive dissonance hypothesis.

With respect to behavior in the ultimatum game, we identify no differences in the distribution of offers across piece rate groups (K-S $p=0.788$) and thereby reject hypothesis H2.1. However, we do identify differences in the distribution of minimum acceptable offers (MAO) across each group: Individuals receiving the low piece rate (who consequently were pessimistic) were willing to accept lower offers than those receiving the high piece rate (who were more optimistic). These differences are significant (K-S $p=0.037$) and we are able to reject the hypothesis that the distributions of MAO by piece rate are drawn from the same population. The distributions of MAO are presented in Figure 3.

Figure 3: Distributions of minimum acceptable offers by piece rate in Experiment 2.
Moreover, we identify a direct effect of the degree of optimism/pessimism on minimum acceptable offers. Specifically, we regress MAO on the degree of optimism/pessimism and piece rates, identifying separate coefficients for each piece rate. That is we estimate

\[ \text{MAO} = \beta_1 \times \text{OP} \times (1 - I_{1.25}) + \beta_2 \times \text{OP} \times I_{1.25} + \beta_3 \times \text{PR} \times (1 - I_{1.25}) + \beta_4 \times \text{PR} \times I_{1.25} + \epsilon, \]  (1)

where OP is the degree of optimism/pessimism, PR is the piece rate a participant received, and \( I_{1.25} \in \{0,1\} \) is an indicator variable taking on a value of one if the participant received a piece rate of a $1.25. This allows us to estimate separate effects of optimism/pessimism across the treatment variable.

Table 3 presents the results of these OLS regressions. We find no difference across piece rates regarding the effect of optimism/pessimism on MAO \( (\beta_1 = \beta_2 = 0.026, F(1,81)=0.02 \) comparing these coefficients).\(^7\) Thus, we can also pool data across treatments (i.e., eliminate the \( I_{1.25} \) dummy variable), which also confirms that the degree of optimism/pessimism has a small positive effect on MAO \( (\beta = 0.073, p = 0.021) \). This suggests that an individual’s MAO increases by $0.73 with a 10 point difference between expected and actual performance.

Relative to the typical ultimatum offer of between $3 and $4 (e.g., see discussion in Camerer, 2003, chapter 2, and Holt, 2007, chapter 12), this effect implies an 18%-24% difference in one’s MAO resulting from this level of induced optimism/pessimism.

\(^7\) The reported results are robust to a fixed effects specification that accounts for subject-specific effects.
The largest effect on MAO is due to the piece rate. We find $\beta_3 = 2.58 \ (p<0.01)$ and $\beta_4 = 10.38 \ (p<0.01)$, and that these coefficients are significantly different from one another ($F(1,81)=75.38$). Similarly, for the pooled data we find a significant positive effect of piece rate on MAO ($2.935, \ p<0.01$). Figure 4 presents the scatterplot of MAO against our measure of optimism/pessimism. These results suggest that the effect of the piece rate on MAO is in some sense discrete: Inducing low self-esteem results in substantially lower MAO among participants. This is in accord with our hypothesis 2.2. Because our design implies that subjects have some sense of whether they would earn more versus less from the cognitive task at the time they engage in the ultimatum game—they know their assigned piece rate but not their task score at the start of the stage two experiment—one might be concerned that wealth effects are responsible for the piece rate effect we estimate. Armantier (2006) examines wealth effects in ultimatum games, however, and concludes that initial round wealth effects work the opposite way. That is, higher endowment subjects have lower MAOs in an effort to equate overall experimental earnings.
Given that our piece rate effect is opposite the wealth-effect result found in Armantier (2006), we feel that our discrete piece rate (indirect) effect of optimism/pessimism on MAOs does not result from unexpected wealth effects in our two-stage design.

Figure 4: MAO plotted against optimism/pessimism measure: $0.25 piece rate given by solid line and diamonds; $1.25 piece rate given by dashed line and squares.

Of course, our results our strongest if we can safely rule out other alternative explanations in addition to ruling the wealth-effects hypothesis. Indeed, one might hypothesize that the discrete effect of lower MAOs in the low piece rate subset of subjects results from subjects anchoring their MAO to the stage-one piece rate. However, such anchoring could not
explain the direct effect of pessimism on MAOs, only the indirect effect of piece rate level on MAO. Furthermore, both high and low piece rate are significantly less than average ultimatum MAOs, which weakens anchoring as a possible explanation for the direct piece rate effect we observe on MAOs in our setting.

4. DISCUSSION

Our key results highlight the interdependence of psychological and behavioral phenomena. A psychological construct (optimism/pessimism) was manipulated in a stage 1 experiment, and the manipulation significantly affected one’s minimum acceptable offer in a stage 2 ultimatum game. Though these data do not consider the robustness of these belief spillover effects into diverse types of environments, they do examine spillovers into a completely unrelated environment with important implications. The “unrelated” environment we examine is simple, yet important given the ultimatum game is a building block of many more complicated environments and is inherent in many economic and social interactions. Our results demonstrate that pessimism (generated in an unrelated environment) negatively affects what an individual is willing to accept or views as fair in a simple bargaining environment (cf. Konow, 2000), suggesting that individuals experiencing pessimism view fair offers (and potentially their own deservingness of monies in the experiment) below those of other individuals. It is unclear why pessimism does not significantly alter ultimatum offers as well, although one might hypothesize an asymmetry between the effects of pessimism in reactive situations (such as being a responder in bargaining) as opposed to proactive ones (i.e., the proposer).

Our result showing that pessimism reduces one’s minimum acceptable ultimatum offer can help explain asymmetries in economic outcomes, such as one’s labor market outcomes.
Outside the laboratory setting, pessimism about one’s future prospects may emerge from poor initial conditions (e.g. living in poverty) and may have subsequent effects in other domains of life. For example, Oxoby (2004) and Montgomery (1994) argue that individuals with low financial endowments experience dissonance regarding their adherence to mainstream norms. As a result, individuals living in poverty may be more likely to withdraw effort from the labor market and support from their families. Indeed this character of pessimism or dissonance is inherent in the Council of Europe’s proposed policies to combat social exclusion (see Avramov, 2002, and Council of Europe, 2001). Pessimism of this sort may manifest itself in lower starting wages or lower and more infrequent wage increases and promotions, both of which may lead to an inferior wage path for pessimistic labor market participants. The inferior wage path would lead to lower relative wages and even greater pessimism (or lower self-esteem—see Goldsmith, et al., 1997), thereby reinforcing the cycle.

As such, combating pessimism can be seen as an important aspect in reducing poverty and reducing social and economic exclusion. Research on social exclusion (Avramov, 2002; Council of Europe, 2001) has argued for the importance of providing “at risk” groups with training programs and access to social services. Proponents of these measures have argued that, among other benefits, access to these services increases individuals’ self-esteem and psychological capital, yielding benefits beyond the human capital benefits. The effect of the spillovers and pessimism sheds light on the research of Gardner and Oswald (2007), who identify large differences and psychological health between the winners of medium-size lotteries and non-winners. Our results suggest that (in part) the gains and psychological well-being experienced by these winners may be attributed to a spillover effect in which the optimism or boost in self-esteem generated by the lottery winnings influences decision-making (and hence
outcomes) in other domains of life. The implications of understanding spillover effects of optimism/pessimism may well extend to a host of other important environments, such as marital success, judgment accuracy, or accident rates (Lyubomirsky and King, 2005).

Our identification of a spillover effect supports other research demonstrating the presence of decision making spillovers. For example, Cherry and Shogren (2007) demonstrate a rationality “crossover” in which the experience of arbitrage in one decision environment affects individuals’ choices in an unrelated task (the Allais paradox, the Ellsberg paradox, and the valuation of food safety risks). In a related paper, Cherry et al (2003) demonstrate how the discipline induced in a market environment can spill over and increase the degree of rationality observed in parallel nonmarket settings regarding environmental lotteries. Our examination of spillover effects is most similar to what Cherry and Shogren (2007) call “crossover” effects, in that our laboratory-induced optimism and pessimism in one environment spills over to affect decisions in an unrelated environment. However, our results additionally highlight how random shocks may harm or improve one’s psychological well-being, such that a random “run” of luck may be quite important in determining future outcomes for that individual. What we examine is perhaps a more fundamental character of spillovers given that the disciplining created by market environments and arbitrage may not only provide individuals with an opportunity to learn but may also affect their moods and dispositions. ⁸

Methodologically, our first result demonstrates that a micro-component of one’s psychological disposition can be manipulated in the lab. The primary importance of this result is that we can then examine laboratory-induced beliefs that are orthogonal to one’s general psychological capital, because the low versus high piece rates were assigned randomly to

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⁸ Laury and Taylor (2006) examine what they call “altruism spillovers”. However, their investigation is one of external validity and whether laboratory measures of altruism can predict donations in a naturally occurring public goods contribution environment. Thus, the terminology of “spillover” effects is not uniform in the literature.
subjects and participants were aware of this random assignment. We exploit the attitudinal responses to cognitive dissonance to generate this initial result and believe that this approach has applicability beyond our experiments. In other words, our experimental methodology highlights how events can ascribe beliefs, for good or bad, which implies that one’s optimism or pessimism is built and rebuilt on a constant basis. So, even dispositionally pessimistic individuals can be ascribed optimism that may be reinforced through spillover effects.⁹

Of course, this research has its limitations. First, it is unclear whether different types of beliefs carry more or less importance when spillover effects exist. Perhaps pessimism with respect to one’s relative abilities on a cognitive task would have a greater effect in environments where one interacts with others, such as the ultimatum game. We examine only one type of optimism/pessimism in our experiment, just as we examine only one environment (ultimatum bargaining) for spillover effects. We feel that our examination of unrelated environments during the belief manipulation and the bargaining experiment stages is a virtue of this design, to the extent that spillover effects in highly unrelated environments is a greater challenge to the spillover effect hypothesis. An obvious extension of this research is to examine different types of belief manipulation, in perhaps different environments, and explore potential spillover effects beyond bargaining games or perhaps farther removed from the optimism/pessimism event.

Our data generally support existing research on cognitive dissonance, as well as psychological research on personality disposition. Dispositional optimism-pessimism is, of course, more general than the optimism/pessimism we generate in the lab but, to the extent that one’s macro-disposition is the product of micro-beliefs from individual situations, our laboratory

⁹ We assume, of course, that our subject pool includes both dispositionally optimistic and pessimistic individuals, though we do not gather data on this personality attribute. This highlights the importance of our initial random assignment to the high versus low piece rate task. Such an approach is similar to the mood induction techniques employed by Charness and Levin (2005) and McLeish and Oxoby (2007).
generated belief structure is significant. It implies that even psychological constructs are open to laboratory manipulation. This helps make possible more systematic experimental studies of key psychological variables and their spillover effects, which can highlight the more complete impact of one event on outcomes elsewhere.
REFERENCES


Appendix A: Instructions for Experiment 1

Instructions

This is an experiment in decision-making. During the experiment you will make a number of decisions which will result in a monetary payoff. You will receive this payment in cash at the end of the experiment. This payment is considered both compensation for the time and the effort you put into making your decisions.

The experiment will proceed in three stages and will last approximately 30 minutes. We ask you to refrain from speaking with one another throughout the course of the experiment. If you have any questions please raise your hand and one the monitors will assist you.

In the first stage of the experiment, you will engage in a task, which is described next.

The task involves reading a short sentence that describes the order of 3 or 4 letters. The short sentence will appear on your computer screen for exactly 3 seconds. Your task is to decide the correct order of the letters based on the description in the short sentence. The sentence will disappear after 3 seconds and another sentence will not reappear for an additional 5 seconds. Before the next sentence appears you are to write down the correct order of the letters (the ones that just disappeared) on your ‘LETTER ORDER’ sheet. New short sentences will keep appearing, each time for 3 seconds followed by a 5 second break before the next sentence appears. There will be a total of 64 short sentences that will appear before this portion of the experiment is completed.

Because a 3-letter sentence can possibly imply different letter-orders, depending on your interpretation of the sentence, you must determine the proper order of each 3-letter sentence by doing the following. First, determine the order of the first two letters. Then, keep those two letters together and determine where the third letter should go in relation to the first pair of letters. The same rule applies to determining the proper order of each 4-letter sentence. First, determine the order of the first two letters. Then, keep those two letters together and determine where the third letter should go in relation to the first pair of letters. Then, keep those three letters together and determine where the fourth letter should go in relation to the first three letters.

Using this rule, there is only one unique letter-order for any 3- or 4-letter sentence, and it is the letter-order that comes from using this rule that the experimenter will count as the correct response.

Here are some examples of short sentences followed by the correct letter-order.

<table>
<thead>
<tr>
<th>Short sentence</th>
<th>correct order</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) A is followed by D is followed by B is preceded by C</td>
<td>CADB</td>
</tr>
<tr>
<td>2) Z does not precede X does not follow Y</td>
<td>XZY</td>
</tr>
</tbody>
</table>

Once you start the main test, sentences will continue to appear for 3 seconds, followed by a 5 second break before the next sentence appears. For each short sentence you are to write down the correct letter order on your ‘LETTER ORDER’ sheet. You are not allowed to write anything on your letter order sheet other than your letter-order response (e.g., writing down the sentence to think about it later). Any such activity will result in your disqualification from the experiment! Recall that the sentences will continue to reappear for a total of 64 total short sentences.
Finally, you will be paid today for each short sentence for which you answer the correct letter-order. The amount you will be paid for each correct letter-order response will either be $.25 or $1.25. You will not know which payment rate applies in advance of completing this portion of the test. After you have completed the 64 sentences, the computer will randomly draw one of these payment rates to apply to all 64 sentences. In other words, if the payment is $.25 for each correct letter-order, then we will pay you $.25 times the number of correct letter-order responses you made (out of all 64 sentences). If the payment rate is $1.25, then we will pay you $1.25 times the number of correct letter-order responses you made (out of all 64 sentences).

After you have completed this first portion of the experiment you will be asked two questions. First, you will be asked to indicate (on a scale of 1-10) how much you enjoyed the task. Secondly, you will be asked to estimate the number of questions you correctly answered. You will receive a separate monetary payment based on the accuracy of this estimate. Specifically, you will receive a $5.00 payment if your estimate is correct, and you will receive a $3.00 payment if you estimate is within two of the actual number of letter-orders you correctly indicated.

After you have entered this information you will be informed of the number of questions you correctly answered and your total payoff from the experiment. You will be asked to complete a short questionnaire, after which the experiment will end and you will receive your payment for having participated.

Once we have answered any questions, the experiment will begin.
Appendix B: Instructions for Experiment 2

Instructions

This is an experiment in decision-making. During the experiment you will make a number of decisions which will result in a monetary payoff. You will receive this payment in cash at the end of the experiment. This payment is considered both compensation for the time and the effort you put into making your decisions.

The experiment will proceed in three stages and will last approximately 30 minutes. We ask you to refrain from speaking with one another throughout the course of the experiment. If you have any questions please raise your hand and one the monitors will assist you.

In the first stage of the experiment, you will engage in a task, which is described next.

The task involves reading a short sentence that describes the order of 3 or 4 letters. The short sentence will appear on your computer screen for exactly 3 seconds. Your task is to decide the correct order of the letters based on the description in the short sentence. The sentence will disappear after 3 seconds and another sentence will not reappear for an additional 5 seconds. Before the next sentence appears you are to write down the correct order of the letters (the ones that just disappeared) on your ‘LETTER ORDER’ sheet. New short sentences will keep appearing for 3 seconds followed by a 5 second break before the next sentence appears. There will be a total of 64 short sentences that will appear before this portion of the experiment is completed.

Because a 3-letter sentence can possibly imply different letter-orders, depending on your interpretation of the sentence, you must determine the proper order of each 3-letter sentence by doing the following. First, determine the order of the first two letters. Then, keep those two letters together and determine where the third letter should go in relation to the first pair of letters. The same rule applies to determining the proper order of each 4-letter sentence. First, determine the order of the first two letters. Then, keep those two letters together and determine where the third letter should go in relation to the first pair of letters. Then, keep those three letters together and determine where the fourth letter should go in relation to the first three letters.

Using this rule, there is only one unique letter-order for any 3- or 4-letter sentence, and it is the letter-order that comes from using this rule that the experimenter will count as the correct response.

Here are some examples of short sentences followed by the correct letter-order.

<table>
<thead>
<tr>
<th>Short sentence</th>
<th>correct order</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) A is followed by D is followed by B is preceded by C</td>
<td>CADB</td>
</tr>
<tr>
<td>2) Z does not precede X does not follow Y</td>
<td>XZY</td>
</tr>
</tbody>
</table>

Once you start the main test, sentences will continue to appear for 3 seconds, followed by a 5 second break before the next sentence appears. For each short sentence you are to write down the correct letter order on your ‘LETTER ORDER’ sheet. You are not allowed to write anything on your letter order sheet other than your letter-order response (e.g., writing down the sentence to think about it later). Any such activity will result in your disqualification from the experiment! Recall that the sentences will continue to reappear for a total of 64 total short sentences.

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Finally, you will be paid today for each short sentence for which you answer the *correct* letter-order. The amount you will be paid for *each* correct letter-order response will either be $.25 or $1.25. You will not know which payment rate applies in advance of completing this portion of the test. After you have completed the 64 sentences, the computer will randomly draw one of these payment rates to apply to all 64 sentences. In other words, if the payment is $.25 for each correct letter-order, then we will pay you $.25 *times* the number of correct letter-order responses you made (out of all 64 sentences). If the payment rate is $1.25, then we will pay you $1.25 *times* the number of correct letter-order responses you made (out of all 64 sentences).

After you have completed this first portion of the experiment you will be asked two questions. First, you will be asked to indicate (on a scale of 1-10) how much you enjoyed the task. Secondly, you will be asked to estimate the number of questions you *correctly* answered. You will receive a separate monetary payment based on the accuracy of this estimate. Specifically, you will receive a $5.00 payment if your estimate is correct, and you will receive a $3.00 payment if you estimate is within two of the actual number of letter-orders you correctly indicated.

After you have entered this information you will be informed of the number of questions you correctly answered and your total payoff from this part of the experiment.

Next, you will randomly be matched with another person. Eventually, the computer will assign one of you to the role of Proposer and one of you to the role of Responder. Before this random assignment is made, you must indicate what you would do if you were put in either role. In the role of Proposer, you will be asked how much (out of a total of $10) you wish to allocate to the other person. The amount of money that you keep for yourself will be $10 minus your earnings to make up your final payoff.

In the role of Proposer, you will be asked how much (out of a total of $10) you wish to allocate to the other person. The amount of money that you keep for yourself will be $10 minus your earnings to make up your final payoff.

You will be asked to complete a short questionnaire, after which the experiment will end and you will receive your payment for having participated.

Once we have answered any questions, the experiment will begin.

**Warm-Up Exercises**

1. If you are assigned the role of Proposer and you indicated that you would allocate the other person $3, how much will you receive if this offer is accepted?
2. If you are assigned the role of Responder and you are allocated $6, how much will you receive if you indicated that you would accept a $6 offer? How much will you receive if you indicated that you would reject a $6 offer?
Appendix C: Answer sheet used in both experiments

Please indicate the letter order from each of the numbered short sentences that appears. You are not allowed to write anything else anywhere on this sheet or your instructions.

<table>
<thead>
<tr>
<th>Sentence number</th>
<th>My letter order response</th>
<th>Sentence number</th>
<th>My letter order response</th>
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