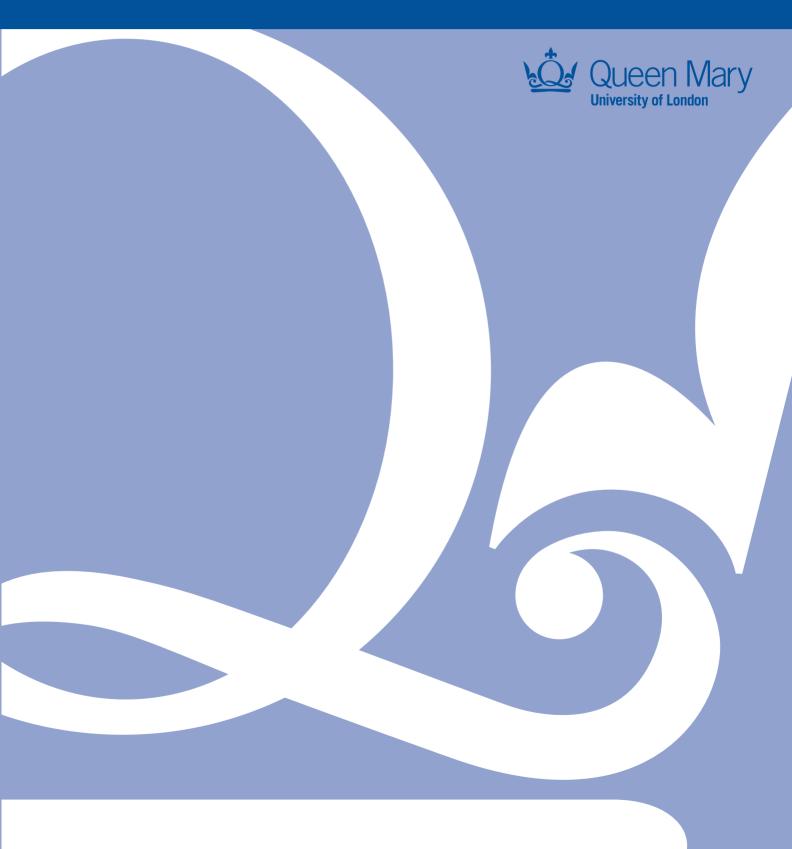
# School of Economics and Finance

:\_UZgZUfR]4YRdRTeVcZdeZfdR\_U3VYRgZcZ\_CVaVReVU8R^Vd+ 2\_6i a VcZ^ V\_eR] Def Uj

5 f X]Rd 5 RgZdL 2dV\_ :gR\_ g R\_U @]VX < cV\_ \

Working Paper No. (#)

@Te SVc 2014 ISSN 1473-0278



# Individual Characteristics and Behavior in Repeated Games: An Experimental Study\*

Douglas Davis

Asen Ivanov<sup>†</sup>

Virginia Commonwealth University

Queen Mary, University of London

Oleg Korenok

Virginia Commonwealth University

June 25, 2014

#### Abstract

Using a laboratory experiment, we investigate whether a variety of behaviors in repeated games are related to an array of individual characteristics that are popular in economics: risk attitude, time preference, trust, trustworthiness, altruism, strategic skills in one-shot matrix games, compliance with first-order stochastic dominance, ability to plan ahead, and gender. We do find some systematic relationships. A subject's patience, gender, altruism, and compliance with first-order stochastic dominance have some limited systematic effects on her behavior in repeated games. At the level of a pair of subjects who are playing a repeated game, each subject's patience, gender, and ability to choose an available dominant strategy in a one-shot matrix game systematically affect the frequency of the cooperate-cooperate outcome. However, overall, the number of systematic relationships is surprisingly small.

<sup>\*</sup>Financial support from the National Science Foundation is also gratefully acknowledged (Grants SES-1034527 for Davis and Korenok, and SES-1030467 for Ivanov).

 $<sup>^\</sup>dagger \text{Corresponding author; School of Economics and Finance, 327 Mile End Road, London E1 4NS, United Kingdom; a.ivanov@qmul.ac.uk$ 

### 1 Introduction

Laboratory experiments on repeated games have shown that there is substantial heterogeneity across subjects: some cooperate a lot while others hardly do so (e.g., see Dal Bó and Fréchette (2011a, 2011b) and Davis et al. (2010)). This raises the question of whether the behavior of subjects in repeated games is related to other individual characteristics. We address this question by focusing on an array of individual characteristics that are popular in economics and may plausibly be related to behavior in repeated games: risk attitude, time preference, trust, trustworthiness, altruism, strategic skills in one-shot matrix games, compliance with first-order stochastic dominance, ability to plan ahead, and gender.

Research on the relationship between individual characteristics and behavior in repeated games could be useful in at least three ways. First, it could provide insights into what motivates the different kinds of behavior in repeated games. Second, such research could tell us whether (i) at the individual level, a player's individual characteristics help predict her behavior in repeated games and (ii) at the pair level, the individual characteristics of a pair of players help predict to what extent cooperation would emerge if these players are matched to play a repeated game. Third, such research could be used to guide theoretical developments on repeated games.

To better understand the sources of heterogeneous play, we conducted a laboratory experiment in which each subject attended two sessions. In session 1, subjects played for several matches a two-player repeated game based on a "Mini-Bertrand" stage game, a three-price version of the regular Bertrand game.<sup>2</sup> Following the repeated Mini-Bertrand (RMB) games, subjects played for several matches a repeated Prisoner's Dilemma (RPD). In session 2, subjects performed an array of tasks meant to measure the individual characteristics of interest.

We do find some systematic relationships between individual characteristics and behavior in repeated games. At the individual level, a subject's patience, gender, altruism, and compliance with first-order stochastic dominance have some limited

<sup>&</sup>lt;sup>1</sup>Our experiment is based on indefinitely repeated games, which are similar to infinitely repeated games. Thus, our focus is on infinitely and indefinitely repeated games. Finitely repeated games involve some very different issues related to backward induction.

<sup>&</sup>lt;sup>2</sup>We use "match" to refer to play of a whole repeated game between two subjects. Within each match there are multiple "rounds".

systematic effects on her behavior. At the pair level, each subject's patience, gender, and ability to choose an available dominant strategy in a one-shot matrix game have systematic effects on the frequency of the cooperate-cooperate outcome. None of the remaining individual characteristics systematically affect behavior at either the individual or the pair level. Overall, the number of systematic relationships we find is surprisingly small.

Our paper adds to a small, but growing, experimental literature exploring the connection between behavior in indefinitely repeated games and individual characteristics that are popular in economics.<sup>3</sup> Dreber, Fudenberg, and Rand (2011) find that, when cooperation is an equilibrium with selfish preferences, behavior in the RPD is largely unrelated to giving in the dictator game, answers to survey questions about prosocial behavior outside the lab, and individual characteristics (such as age, belief in God, and risk attitudes); it also appears that men are more cooperative than women.<sup>4</sup> Reuben and Suetens (2012) and Cabral et al. (2012) provide evidence that behavior in indefinitely repeated games is mostly driven by strategic motives rather than by other-regarding preferences or non-strategic reciprocity. These results are consistent with our findings.

In contrast with our findings, Sabater-Grande and Georgantzis (2002) find that cooperative behavior in the RPD is negatively correlated with risk aversion. The discrepancy may be due to the fact that Sabater-Grande and Georgantzis used a version of the RPD that is somewhat different from the version used in our study. In their study, the first 15 rounds were played with shrinking payoffs of the stage game and continuation probability 1; in the remaining rounds, the stage game payoffs were unchanged and there was a positive probability of the game ending after each round.<sup>5</sup>

<sup>&</sup>lt;sup>3</sup>Previous studies have also looked at certain "soft" personality traits that are more popular in psychology, such as the Big-5 (Borghans et al. (2008)). See Kurzban and Houser (2001) and the references therein.

<sup>&</sup>lt;sup>4</sup>The RPD games were with noisy implementation of actions. That is, there was some probability that a subject's chosen action was changed to the opposite action.

<sup>&</sup>lt;sup>5</sup>A number of studies look at the relationship between individual characteristics and behavior in finitely repeated games. Dolbear and Lave (1966) investigate the relationship between risk attitude and a measure of lenience in the finitely repeated Prisoner's Dilemma (namely, how often a subject cooperates against a "stooge" who always defects). Al-Ubaydli, Jones, and Weel (2013, 2014) study the relationship between, on the one hand, individual characteristics (cognitive ability, patience, risk attitude, the Big-5, gender, and age) and, on the other hand, behavior in the finitely repeated stag-hunt game and the finitely repeated Prisoner's Dilemma. Drouvelis and Jamison (2012) study the relationship between, on the one hand, behavior in finitely repeated public good games with

Our study contributes beyond previous studies in that we consider a wide array of additional individual characteristics that are popular in economics. In particular, to the best of our knowledge, no previous study has looked at the connection between, on the one hand, behavior in indefinitely repeated games, and, on the other hand, patience, trust, trustworthiness, strategic skills in one-shot matrix games, compliance with first-order stochastic dominance, and ability to plan ahead.

The remainder of the paper is organized as follows. In section 2, we explain the experimental design. Section 3 explains how we quantify subjects' behavior in repeated games. Section 4 examines the possible connections between the individual characteristics we consider and behavior in repeated games. Section 5 contains the data analysis. Section 6 concludes.

# 2 Experimental Design

In our experiment, each subject attended two sessions that were one week apart. Subjects were grouped into cohorts with all subjects in a cohort attending sessions 1 and 2 together. There were 92 participants who attended session 1 and were grouped in three cohorts of roughly equal size; 87 of these participants returned for the second session.<sup>6</sup>

Subjects were undergraduate students at Virginia Commonwealth University (VCU). The experiment was conducted at the Experimental Laboratory for Economics and Business Research at VCU. Each session lasted around 2 hours. The experiment was programmed and conducted with the software z-Tree (Fischbacher (2007)).

### 2.1 Session 1

In session 1, we used an RMB game and an RPD game. The stage games are shown in the two panels of Figure 1. The Mini-Bertrand stage game is an especially designed version of a regular Bertrand game in which players are allowed to post only three

rewards and punishments, and, on the other hand, risk aversion, ambiguity aversion, and loss aversion. Kimbrough and Vostroknutov (2013) divide subjects into groups based on the strength of their preference for following rules and have them play finitely repeated public good games. Groups composed of individuals with a strong preference for following rules are more able to sustain cooperation over time.

 $<sup>^6\</sup>mathrm{We}$  also conducted a pilot with 12 participants. We exclude the pilot data from the analysis.

### Mini-Bertrand

	Н	M	L
Н	40,40	0,60	0,40
M	60,0	30,30	0,40
L	40,0	40,0	20,20

#### Prisoner's Dilemma

	С	D
С	40,40	0,60
D	60,0	20,20

Figure 1: Stage games. Payoffs are in ECU. The exchange rate was 500 ECU/\$1.

prices—a high price (H), medium price (M), and low price (L).<sup>7,8</sup> In both the RMB and RPD, the continuation probability was  $\delta = 0.93$ . That is, in each round there was a 0.07 probability that the game will end after that round.

In both the RMB and RPD, the most cooperative action (i.e., H/C in the RMB/RPD) can be sustained as part of a subgame-perfect Nash equilibrium. Nevertheless, the stage game in the RMB and the stage game in the RPD are very different strategically. In the latter, D is a dominant strategy for each player. In the former, there is a unique Nash equilibrium in which both players choose L, but there is no dominant strategy. This suggests, but does not guarantee, that the RMB and RPD games are in some sense also quite different from each other.

Subjects played in pairs one practice RMB and thirteen RMB games for cash and, after that, one practice RPD and thirteen RPD games for cash.<sup>10</sup> At the end of each match, subjects were randomly and anonymously rematched into new pairs.<sup>11</sup> In any

<sup>&</sup>lt;sup>7</sup>In a regular repeated Bertrand game with many possible prices, it is less clear how to quantify behavior (see section 3).

<sup>&</sup>lt;sup>8</sup>The payoffs in the Mini-Bertrand matrix can be obtained from a typical Bertrand game in which firms with zero production costs are choosing whether to post a price of 1, 2, or 3 when facing a market demand function  $D(\cdot)$  with D(1) = 40, D(2) = 30, and  $D(3) = \frac{80}{3}$ .

<sup>&</sup>lt;sup>9</sup>In fact, in both the RMB and RPD, the most cooperative action can be sustained as part of a subgame-perfect Nash equilibrium as long as  $\delta \geq 0.5$ . Furthermore, in both the RMB and RPD, cooperation is risk dominant in the sense defined by Dal Bó and Fréchette (2011a) as long as  $\delta \geq 2/3$ . (For risk dominance to be applied to the RMB, one needs to define (i) the always-defect strategy as prescribing L at any history and (ii) the grim-trigger strategy as prescribing L at any history at which the opponent chose M or L in the past and prescribing H at all other histories.)

<sup>&</sup>lt;sup>10</sup>In the first cohort, subjects played 15 RMB games for cash and 14 RPD games for cash. For comparability with the other cohorts, we exclude the last two RMB games and the last RPD game from the data analysis.

 $<sup>^{11}</sup>$ To facilitate comparison across cohorts, game lengths were drawn in advance, and the same game lengths were used in each cohort. The lengths of the thirteen RMB games were 5, 16, 15, 3, 2, 10, 6, 13, 4, 20, 5, 10, and 17 rounds. The lengths of the thirteen RPD games were 3, 5, 26, 5, 24, 4, 6, 4, 4, 14, 9, 6, and 25 rounds.

round during a repeated game, except in round 1, each subject could see the choices she and the other subject had made in all previous rounds of the repeated game.

A subject's earnings from a given match equaled the sum of the experimental currency units (ECU) earned in all rounds of that match. A subject's total earnings for the session equaled a \$6 show-up fee plus the accumulated earnings from all matches, converted at an exchange rate of 500 ECU/\$1. Average earnings for the session (including the show-up fee) equaled \$24.29.<sup>12,13</sup>

At the start of the session, the experimenter read the instructions aloud as subjects read along, seated at their computer terminals.<sup>14</sup> After clarifying questions, subjects completed a short understanding test. Experimenters walked around checking subjects' quizzes, answering questions, and explaining mistakes. In case a subject made a mistake, extra care was taken to make sure she understood the task.

### 2.2 Session 2

In session 2, subjects performed an array of tasks meant to measure individual characteristics that are popular in economics and may plausibly be related to behavior in repeated games: risk attitude, time preference, trust, trustworthiness, altruism, strategic skills in one-shot matrix games, compliance with first-order stochastic dominance, and ability to plan ahead. The order of the tasks was different across cohorts. We also recorded each participant's gender through a dummy variable, *Male*, that equals 1 for a male participant and 0 for a female one.

<sup>&</sup>lt;sup>12</sup>In each round, subjects also had to forecast the current-round choice of the other player and obtained 5 ECU for each correct forecast. This feature of our design was included because we were initially interested in issues that turned out to be peripheral. Subjects' forecasts are excluded from the main analysis, but are studied in the appendix. Subjects' earnings from forecasts made up only a small portion of their total earnings—on average, earnings from forecasts equalled \$1.99 (and the maximum was \$2.34).

One might wonder if forecast elicitation affected behavior. At least for the RPD, there appear to be no large effects: Davis et al. (2013) use a very similar version of the RPD (the only differences were the exchange rate and the number of matches—20 instead of 13) and behavior is quite similar even though there is no forecast elicitation. Note that even if forecast elicitation does affect behavior, this is only a concern if it affects behavior differentially for subjects with different individual characteristics, e.g., if forecast elicitation makes patient subjects cooperate more while it does not affect the behavior of impatient subjects.

<sup>&</sup>lt;sup>13</sup>To guarantee that subjects would return for session 2, they were paid only \$10 from their earnings at the end of session 1. The balance, plus any earnings in session 2, were paid to them at the end of session 2.

<sup>&</sup>lt;sup>14</sup>The instructions are in the appendix.



Figure 2: Screenshot from Risk Attitude Task.

Subjects were paid for one randomly chosen task.<sup>15</sup> Average earnings, including the \$6 show-up fee, equaled \$24.07.

Before each task, the experimenter read the instructions for that task aloud as subjects read along, followed by clarifying questions.<sup>16</sup> Below, we describe each task in more detail. After that, we address the possibility that these tasks may measure subjects' "true" individual characteristics with error.

#### 2.2.1 Risk Attitude

Subjects made ten Holt and Laury (2002) style choices between a safe lottery (Option A) and a risky lottery (Option B). In each decision, the safe lottery offered a \$20 prize with probability p and a \$16 prize with probability 1-p. The risky lottery offered a \$38.5 prize with probability p and a \$1 prize with probability p. In decision 1, p equalled 0.1 and increased in increments of 0.1 for each subsequent decision, so that the risky lottery became progressively more appealing relative to the safe lottery. In decision 10, both lotteries paid the high prize with certainty, so that the risky lottery was clearly superior. A screenshot from this task is given in Figure 2. Subjects were told to imagine that the computer rolls a ten-sided die to determine the outcome of a lottery. The vertical line in the description of a given lottery in the screenshot indicates that if the random number is to the left/right of this bar, the left/right prize is realized.

Subjects were told that the payment for this task, subject to this task being chosen for payment purposes, would be determined as follows. The computer randomly selects one of the ten decisions. Each subject is paid according to the lottery she chose in that decision, with the computer rolling an imaginary die to determine the lottery outcome.

Our measure of a subject's behavior in this task is  $N_{risky}$ , the number of decisions in which she chose the risk lottery.<sup>18</sup> A higher value of  $N_{risky}$  indicates more risk loving. Two subjects always chose the safe lottery despite the fact that it is clearly inferior in decision 10. For these subjects, the low value of  $N_{risky}$  (namely,  $N_{risky} = 0$ ) may indicate a kind of misunderstanding of the task that has nothing to do with risk attitude. Therefore, we create a dummy variable  $A_{risk}$  that equals 1 for these two subjects and equals 0 for everyone else. Including this dummy in our regressions will allow them to treat these subjects differently, so that these subjects' behavior will

 $<sup>^{15}</sup>$ This task was randomly determined ahead of time and was the task with one-shot matrix games. Subjects were not told which task was selected for payment purposes until the end of the session.

<sup>&</sup>lt;sup>16</sup>The instructions are in the appendix. For some of the tasks, subjects also completed a short understanding quiz. See the instructions for details.

<sup>&</sup>lt;sup>17</sup>In decision 10, Option B is not really risky as it pays \$38.5 with certainty. Nevertheless, for brevity, we still refer to it as the "risky lottery."

<sup>&</sup>lt;sup>18</sup>To avoid multiple switch points, subjects were told that if they chose Option B on any decision, they had to keep choosing Option B on subsequent decisions as well.

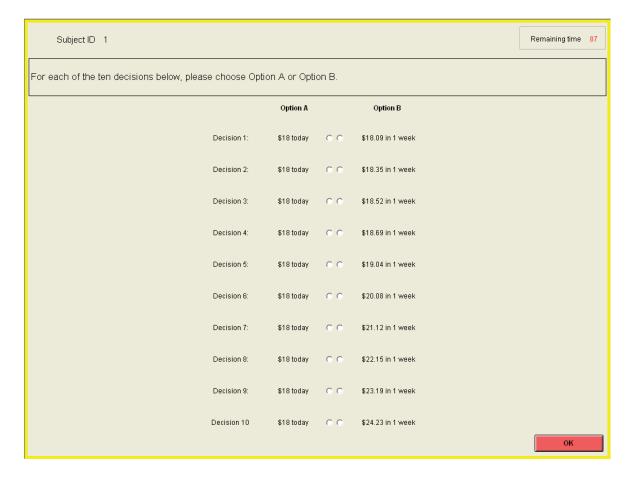


Figure 3: Screenshot from Time Preference Task.

not affect the estimated coefficient on  $N_{risky}$ . (The estimated coefficient on  $A_{risk}$  will be of no interest.)

#### 2.2.2 Time Preference

Subjects made ten choices between receiving \$18 today (Option A) and receiving x in one week (Option B), where x = 18.09 in decision 1 and x increases in subsequent decisions. A screenshot from this task is given in Figure 3.

Subjects were told that the payment for this task, subject to this task being chosen for payment purposes, would be operationalized as follows. The computer randomly selects one of the ten decisions and each subject is paid according to her preferred option in that decision. In particular, if the subject chose the "today" option, she receives a check that can be cashed immediately; if she chose the "in-one-week" option,

she receives a check with a date on it that is one week in the future, i.e., the subject has to wait for one week before being able to cash the check.

Our measure of a subject's behavior in this task is  $N_{patient}$ , the number of decisions in which she was patient and chose the "in-one-week" option.<sup>19</sup>

### 2.2.3 Trust and Trustworthiness

Subjects played a binary-choice trust game in which a first mover decides whether to keep \$16 or pass them to the second mover. If the first mover decides to pass, the money is tripled, so that the second mover has \$48 at her disposal. The second mover then decides whether to keep all \$48 or keep only \$24 and pass back \$24 to the first mover.

Subjects were anonymously paired to play the game. Each subject had to decide how she would behave both as a first mover and as a second mover. Subjects were told that the payment for this task, subject to this task being chosen for payment purposes, would be determined as follows. After each subject in a pair has made her decisions in the role of a first mover and a second mover, the computer randomly assigns the first mover role to one of the subjects and the second mover role to the other subject. Each subject's payment is determined based on the choice she made for her assigned role and the choice the other subject made for the other role.

Our measures of a subject's behavior in this task are: (i) Trust, a dummy variable that equals 1 if the subject's decision as a first mover was to pass the \$16 to the other subject and equals 0 otherwise and (ii) Trustworthy, a dummy variable that equals 1 if the subject's decision as a second mover was to pass back \$24 and equals 0 otherwise.

### 2.2.4 Altruism

Each subject was endowed with \$20 and had to decide how much of this amount to keep for herself (any integer between 0 and \$20 was allowed) and how much to donate to the charity "Feed the children," about which subjects were given some basic information. Subjects were told that, at the end of the experiment, the experimenter

<sup>&</sup>lt;sup>19</sup>To avoid multiple switch points, subjects were told that if they chose Option B on any decision, they had to keep choosing Option B on subsequent decisions as well.

would add up all donations and write a check to the charity for the total amount. Subjects were also told that the check would be mailed immediately after the session, and were encouraged to accompany the experimenter to the closest mailbox (which was across the street). Our measure of a subject's behavior in this task is Alt, the fraction of the endowment contributed to the charity.

### 2.2.5 Strategic Skills in One-Shot Matrix Games

	LEFT	CENTER	RIGHT
UP	18,17	14,25	26,18
DOWN	11,9	21,16	11,7

Figure 4: One-shot matrix game. Payoffs are in dollars.

Subjects were anonymously matched into pairs and each pair played two matrix games without feedback. One of the subjects in a pair played as the row player while the other subject played as the column player. The first matrix game is presented in Figure 4. Notice that CENTER is a dominant strategy for the column player. The second matrix game is a transposed version of the first one, in which, to disguise the relationship with the first game, we scrambled the order of the rows and columns and subtracted \$1 from each payoff. Thus, in effect, each subject played the game in Figure 4 from both sides. <sup>20</sup> Subjects were told that, subject to this task being chosen for payment purposes, the computer would randomly choose one of the two matrix games and subjects would be paid based on that game.

Our measures of a subject's behavior in this task are: (i) Dom, a dummy that equals 1 if the subject plays a dominant strategy when one is available and equals 0 otherwise and (ii) Str, a dummy that equals 1 if a subject chooses a best-response to the opponent's dominant strategy (whenever the opponent has a dominant strategy) and equals 0 otherwise. Dom is meant to capture very basic rationality in a game; Str is meant capture a kind of strategic thinking that goes one level deeper, namely whether a subject thinks about her opponent's incentives for choosing different strategies.

 $<sup>^{20}</sup>$ To keep the presentation similar for both subjects, we presented each game in a transposed form to the column player, so that she too had to choose a row.

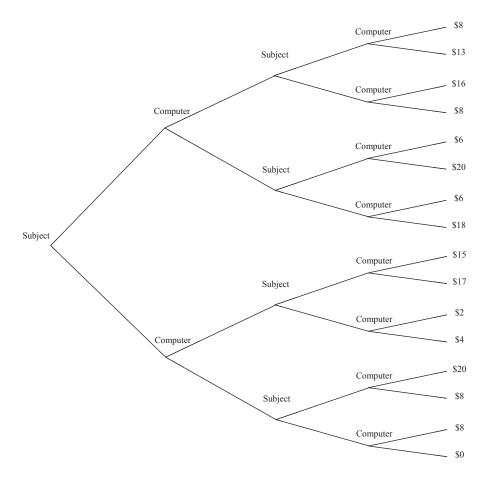


Figure 5: Decision Tree Task.

# 2.2.6 Compliance with First-Order Stochastic Dominance and Ability to Plan Ahead

Subjects performed a task developed by Bone et al. (2009) to test whether people plan ahead. As a by-product, the task also measures whether people respect first-order stochastic dominance. The task is based on the decision tree presented in Figure 5. In this decision tree, the subject moves first by choosing UP or DOWN. Next, the computer moves by choosing UP or DOWN with 50-50 chance. Then, the subject moves again UP or DOWN, followed by another 50-50 UP or DOWN move by the computer. The sequence of moves by the subject and the computer leads to a payoff which the subject receives if this task is selected for payment purposes.

The decision tree has the following two key features. First, whenever a subject has to make her second move, one of her two choices first-order stochastically dominates the other one. Second, if a subject plans ahead and anticipates this when making her first move, DOWN first-order stochastically dominates UP at the initial node. In particular, fixing a subject's choices at all four second-move nodes in a way that respects first-order stochastic dominance, a choice of UP at the initial node leads to a uniform-distribution lottery over \$6, \$8, \$16, \$20 while a choice of DOWN leads to a uniform-distribution lottery over \$8, \$15, \$17, \$20.

Our measures of a subject's behavior in this task are: (i) FOSD, a dummy that equals 1 if the subject respects first-order stochastic dominance at her second move and equals 0 otherwise and (ii) PA, a dummy that equals 1 if a subject chooses DOWN at her first move and equals 0 otherwise. FOSD is meant to capture very basic rationality in choice under risk; PA is meant to capture whether a subject plans ahead to the future in deciding what is currently optimal.

#### 2.2.7 Measurement Error

Later, we will use the individual characteristics variables defined above as right-handside variables in regressions in an attempt to see if they predict behavior in repeated games. However, it is possible that these variables capture subjects' "true" individual characteristics with error. Such measurement error would bias the coefficient estimates in our regressions downwards.

There are two possible sources of measurement error. First, some subjects could make a mistake and not choose in accordance with their true preferences/abilities. Although some such mistakes invariably occur, the danger of large and/or widespread mistakes is limited by the fact that we use standard tasks that are well established in the literature.

Second, Dom, Str, FOSD, and PA may involve measurement error even if subjects are not making mistakes. In particular, Dom measures the kind of basic rationality we are after with error because a subject who does not recognize the dominant strategy may nevertheless choose it by fluke. However, there should still be sufficient separation between subjects who do and subjects who do not recognize the dominant strategy because the former group would always choose the dominant strategy while the latter will often fail to do so.

Str may also measure the kind of strategic thinking we are after with error because

(i) even a subject who does not think about the opponent's incentives may still choose a best-response to the opponent's dominant strategy by fluke and (ii) even a subject who thinks about the opponent's incentives may still have serious doubts about the opponent's rationality and, hence, about whether the opponent would play her dominant strategy. The possibility for measurement error due to (i) is diminished by evidence that naive players choose the strategy with the highest average payoff, which in our games is different from the best-response to the opponent's dominant strategy (see Costa-Gomes et al. (2001)). (For example, in Figure 4 DOWN is a best-response for the row player to the column player's dominant strategy while UP has the higher average payoff.) The possibility for measurement error due to (ii) is diminished by the fact that, in our games, a subject who thinks about the opponent's incentives need not be certain that the opponent will play her dominant strategy: in Figure 4, it suffices that the row player assigns a probability greater than or equal to  $\frac{15}{22}$  to the opponent playing her dominant strategy for DOWN to be a best-response (assuming linear utility).

FOSD measures the kind of basic rationality we are after with error because a subject who does not recognize first-order stochastic dominance may nevertheless make the right choice at her second move in the decision tree by fluke. However, there should still be sufficient separation between subjects who do and subjects who do not recognize first-order stochastic dominance because the former group would always make the right choice at the second move while the latter will often fail to do so.

PA may also measure the kind of planning ahead we are after with error because even a subject who does not plan ahead may still choose DOWN at her first move by fluke. This possibility for measurement error is diminished under the plausible assumption that subjects who do not plan ahead simply compare the top eight payoffs with the bottom eight payoffs: the top eight payoffs simply look better (for example, a lottery that assigns  $1/8^{\rm th}$  chance to each of the top eight payoffs first-order stochastically dominates a lottery that assigns  $1/8^{\rm th}$  chance to each of the bottom eight payoffs).

Overall, although the elicitation tasks probably do involve measurement error (Dom and FOSD almost surely do), these should tasks have sufficient "bite" in

order to allow us to detect any effects of individual characteristics on behavior in repeated games.

# 3 Aspects of Behavior in Repeated Games

To relate behavior in a repeated game to subjects' individual characteristics, we need to be able to somehow formally quantify behavior in the repeated game. The theoretical notion that does this is that of a strategy: a strategy describes how a player behaves at each possible history in the repeated game. The problem is that strategies are notoriously difficult to estimate.<sup>21</sup>

Instead of estimating players' full-blown strategies, we use six summary measures of each player's behavior, called aspects, that were developed in Davis et al. (2013). Before we present these aspects, let us introduce some notation. Consider an RPD game with two players, i and j. Let C stand for "cooperate" and D for "defect". Let (UV, XY,...) denote a history in which i played U and j played V in round 1, i played X and j played Y in round 2, etc., where U,V,X,Y  $\in$  {C,D}. For each subject i, we consider the following aspects.

- Round-1 cooperation (C1): the probability with which i plays C in round 1. Thus, C1 is about how a player starts off the game.
- Lenience (*Len*): the probability with which *i* plays C at history (CD). Thus, *Len* is about not immediately retaliating after a unilateral defection by the other player.
- Forgiveness (Forg): the probability with which i plays C at history (CD,DC). Thus, Forg is about returning to cooperation after punishing the opponent for

<sup>&</sup>lt;sup>21</sup>From an econometric point of view, the main limitation arises from the fact that we observe how each player behaves only at a limited number of histories and, for most of those histories, we have only few observations even if the player played the repeated game many times (because in each repeated game play tends to go down different paths in the game tree). To perform the estimation, one needs to start out by specifying a set of candidate strategies, the crucial assumption being that this set is correctly specified, i.e., that it doesn't omit empirically relevant strategies. This set is typically small. For example, Dal Bó and Fréchette (2011) restrict attention to six strategies. Some studies start out with a larger set of strategies (e.g., Engle-Warnick and Slonim (2006)) and reduce this set by trading off in an essentially ad hoc manner goodness-of-fit against a penalty for having more strategies.

a unilateral defection, which the opponent was quick to correct.

- Loyalty (Loyal): the probability with which i is not weakly first to play D in a game that starts out with (CC). Thus, Loyal is about not breaking a streak of mutual cooperation.
- Leadership (*Lead*): the probability with which *i* is weakly first to play C in a game that starts out with (DD).<sup>24</sup> Thus, *Lead* is about breaking a streak of mutual defections by being the first to cooperate.
- Following (Foll): the probability with which i plays C at history (DC). Thus, Foll is about switching from D to C in response to the opponent playing C.

In the RMB game, we define our aspects exactly as above except that we take "C" to stand for "H" and "D" to stand for "L" or "M."<sup>25</sup>

For each subject i and each repeated game (i.e., the RMB or RPD), we estimate each aspect in that repeated game by computing the corresponding empirical frequencies based on the 13 matches in which the game was played; we denote these frequencies by  $\widehat{C1}$ ,  $\widehat{Len}$ ,  $\widehat{Forg}$ ,  $\widehat{Loyal}$ ,  $\widehat{Lead}$ , and  $\widehat{Foll}$ , respectively. For example, if in the RPD i faced history (CD) 5 times during the 13 matches and played C at that history 3 times,  $\widehat{Len} = 0.6.^{26}$  Although Davis et al. (2013) argue that it is a very crude measure of behavior in repeated games, for completeness sake we also consider  $\widehat{C}$ , the aggregate frequency with which i plays C.<sup>27</sup>

<sup>&</sup>lt;sup>22</sup>Conditional on the game having at least two rounds.

<sup>&</sup>lt;sup>23</sup> "weakly first" allows the possibility that both players play the given action simultaneously.

<sup>&</sup>lt;sup>24</sup>Conditional on the game having at least two rounds.

<sup>&</sup>lt;sup>25</sup>Thus, in the RMB we focus on whether a player chooses H or does not choose H instead of distinguishing between all three prices. There are two reasons for this. First, it allows us to summarize a player's behavior in the RMB using the aspects defined above. Second, there is no clear linear order between actions in the RMB: while H is clearly more "cooperative" than L and M, the latter two cannot be compared according to "cooperativeness." For example, M is more "cooperative" than L after a history of both players posting only L because it indicates an attempt to improve cooperation; on the other hand, M may not be more "cooperative" than L after a history of both players posting only H because in this case M constitutes an attempt to make a profit at the opponent's expense by just undercutting her.

 $<sup>^{26}</sup>$ Note that some of these empirical frequencies may not be defined for i. For example, if in the RPD i never faced history (CD),  $\widehat{Len}$  is not defined. In the RMB/RPD,  $\widehat{C1}$  is defined for 100/100 percent of subjects,  $\widehat{Len}$  is defined for 80/80 percent of subjects,  $\widehat{Forg}$  is defined for 34/36 percent of subjects,  $\widehat{Loyal}$  is defined for 80/90 percent of subjects,  $\widehat{Lead}$  is defined for 74/34 percent of subjects, and  $\widehat{Foll}$  is defined for 71/47 percent of subjects.

<sup>&</sup>lt;sup>27</sup>For brevity, we shall also refer to  $\widehat{C}$  as an aspect even though Davis et al. (2013) do not do so.

Note that the empirical frequencies are obtained from i's behavior over several matches. Thus, either one has to make the implicit assumption that the probabilities in the definitions of each aspect are constant across matches<sup>28</sup> or, alternatively, one could view these probabilities as average probabilities across matches.<sup>29</sup>

# 4 Possible Connections between Individual Characteristics and Behavior in Repeated Games

We chose the particular individual characteristics used in our study for three main reasons. First, they are standard characteristics that play a large role in economics. Second, in contrast with "soft" personality traits used in psychology, they have clear definitions in terms of behavior. Third, although there exists no formal theory linking these individual characteristics to behavior in indefinitely repeated games, there are plausible intuitive arguments for why most of these characteristics might affect behavior in repeated games. Below, we discuss for each individual characteristic whether/how it might affect behavior in repeated games.

Risk attitude: In practice, each player i does not know how the other player j would choose at each history either because i does not know j's strategy or because j's strategy involves mixing. Thus, a player's attitude to risk may affect her behavior in repeated games in potentially systematic ways. We had no prior expectation about the sign of the effect. For example, it is plausible that risk aversion might induce a subject to defect because this guarantees she will earn at least 20 ECU per round and she will never be the "sucker" who earns 0 ECU. On the other hand, risk aversion may also prompt a subject to cooperate out of fear of disrupting existing or potential

<sup>&</sup>lt;sup>28</sup>This assumption is in line with the literature on estimating strategies, in which it is standard to assume that strategies are constant across matches (e.g., see Dal Bó and Fréchette (2011a)). Although this kind of assumption is clearly a simplification, it is probably a reasonable approximation in our experiment: for both the RMB and RPD, (i) the mean and standard deviation of each aspect across subjects are stable between early matches (matches 1-7) and later matches (matches 8-13) and (ii) for each aspect, there is a high correlation between early matches and later matches, i.e., subjects with a relatively high/low value of a given aspect in early matches are also the ones with a relatively high/low value of that aspect in later matches. (See Table 9 in the appendix.)

<sup>&</sup>lt;sup>29</sup>Note also that, because the empirical frequencies are computed based on a limited number of observations, they will be imperfect measures of the underlying probabilities. (E.g.,  $\widehat{C1}$  is an imperfect estimate of C1.) However, because we will use the aspects only as left-hand side variables in the current paper, the measurement error involved does not lead to inconsistent estimates.

mutual cooperation.

Time preference: Cooperating at any point in an indefinitely repeated game requires foregoing current benefits for the sake of expected future benefits. Thus, presumably, patient players would be more likely to cooperate at any point in the game. Thus, we expected  $N_{patient}$  to be positively correlated with our aspects.<sup>30</sup>

Trust: Cooperating requires some trust that the opponent will not defect (in the current round or in the near future or ever). Thus, we expected Trust to be positively correlated with our aspects.

Trustworthiness: One would expect trustworthiness to be positively correlated with  $\widehat{Loyal}$  ( $\widehat{Loyal}$  is to a large extent about not betraying the other player) and, possibly, with  $\widehat{Foll}$  ( $\widehat{Foll}$  is to some extent about rewarding the other player for having displayed trust by choosing the most cooperative action in round 1).

Altruism: Altruism provides additional motives for cooperating. Thus, we expected Alt to be positively correlated with our aspects, except possibly with  $\widehat{Len}$  and  $\widehat{Forg}$ . Just because a subject is generous towards a charity (as captured by Alt) does not mean that she is unconditionally altruistic and would have tolerance for the other player's defections (as captured by  $\widehat{Len}$  and  $\widehat{Forg}$ ).

Strategic skills in one-shot matrix games: Behavior in repeated games requires strategic thinking: "if I do this, the opponent might react like that...". Thus, we thought that basic measures of strategic thinking, such as *Dom* and *Str*, might be correlated with our aspects. We had no prior expectation about the signs of the correlations.

Compliance with first-order stochastic dominance: The measure FOSD emerges as a by-product in the task used for eliciting subjects' ability to plan ahead. FOSD seems like a basic measure of rationality and we included it in our regressions. We had no prior expectation about how this measure might correlate with our aspects.

Ability to plan ahead: In a repeated game, a player needs to think about how

<sup>&</sup>lt;sup>30</sup>For this argument to hold, one needs to assume that subjects obtain utility as ECU are earned rather than when they receive the actual cash at the end of the experiment (or spend the received cash). If subjects obtain utility when they receive (or spend) the actual cash, ECU earned in the current round of a repeated game are just as valuable as ECU earned in later rounds regardless of a subject's patience (since the actual cash is obtained at the end of the experiment all the same). In this case, to properly test the effect of patience on behavior in repeated games, one must have subjects play infinitely (rather than indefinitely) repeated games with a substantial delay between rounds–something that is probably not feasible, especially in the lab.

her current actions affect the opponent's future behavior. Thus, we thought that an independent measure of subjects' ability to plan ahead might be correlated with our aspects. Moreover, because a lack of planning ahead would probably favor defections, we expected the correlations to be positive.

Gender: Many studies (including some on repeated games) have focused on the role of gender. Including this characteristic was easy and seemed natural.

### 5 Results

We start the data analysis by exploring the connection between the individual characteristics variables defined in section 2.2 and the aspects defined in section 3. After that, we investigate whether two subjects' individual characteristics help predict the frequency of the CC outcome (i.e., the outcome in which both players choose C in the RPD or H in the RMB) if these two players are matched to play a repeated game. Then, we consider whether a player's individual characteristics predict her earnings in the repeated games.<sup>31,32</sup>

In our data analysis, we will run a number of regressions with the individual characteristics variables as independent variables and variables that are based on behavior in either the RMB or RPD as dependent variables. Each regression will be run separately for the RMB and RPD. In our regressions, we will focus on coefficients that, for both the RMB and RPD, (i) have the same sign and (ii) are statistically significant at the 10-percent level.<sup>33</sup> In this way, we hope to capture some kind of systematic effects that are at work in different repeated games. In addition, if one estimates many coefficients (as we do), some are likely to turn out statistically significant by fluke (more on this below). However, the possibility that a coefficient

<sup>&</sup>lt;sup>31</sup>Our main goal is not to study individual characteristics or aspects per se, but rather the connection between the two. Nevertheless, for completeness sake, we provide some summary statistics of subjects' individual characteristics and aspects in Tables 7, 8, and 9 in the appendix.

<sup>&</sup>lt;sup>32</sup>For each individual characteristics variable defined in section 2.2, we cannot reject the hypothesis (at the 5-percent level) that its mean value is the same for all three cohorts. (Thus, we find no evidence that the different order of tasks in session 2 had an effect on behavior.) Similarly, for each aspect defined in section 3, we cannot reject the hypothesis (at the 5-percent level) that its mean value in a given repeated game (either the RMB or RPD) is the same for all three cohorts.

<sup>&</sup>lt;sup>33</sup>One could require statistical significance at the 5-percent rather than the 10-percent level. However, we felt that it would be too conservative to dismiss cases in which a coefficient comes out statistically significant at the 10-percent level for both the RMB and RPD.

comes out statistically significant by fluke for both the RMB and RPD is smaller. By way of language, whenever in a regression a coefficient satisfies conditions (i) and (ii), we say that the corresponding individual characteristic variable has a systematic (positive or negative) effect on the dependent variable.

### 5.1 Can Individual Characteristics Explain Aspects?

Table 1 reports the results from OLS regressions of each aspect, as computed separately from the RMB and RPD games, on the individual characteristics variables. Based on this table, we can now state our first result.

**Result 1**  $N_{patient}$  has a systematic positive effect on  $\widehat{Len}$ .<sup>34</sup> Alt has a systematic negative effect on Foll. FOSD has a systematic negative effect on  $\widehat{Loyal}$ . Male has a systematic positive effect on  $\widehat{C}$  and  $\widehat{C1}$ . No other individual characteristic variable (except for  $A_{risk}$ ) has a systematic effect on any aspect.<sup>35</sup>

Perhaps, the most interesting and surprising feature of Result 1 is the overall paucity of relationships between individual characteristics and behavior in repeated games.  $N_{risky}$ , Trust, Trustworthy, Dom, Str, and PA have no systematic effects on behavior. For each of the four variables that do have systematic effects, these effects are limited in the sense that they apply to only one or, at most, two aspects.  $^{36,37}$ 

# 5.2 Can Individual Characteristics Explain the Frequency of the CC Outcome?

Consider two subjects, i and j, who are matched together to play a repeated game. Let FreqCC denote the frequency (on a 0-1 scale, i.e., not in percent) of the CC outcome in that repeated game and, for each individual characteristic variable, let a

 $<sup>\</sup>overline{\ }^{34}$ To get a good sense of the magnitude of the coefficient on  $N_{patient}$ , one could multiply this coefficient by 10. This would give the difference in the value of the dependent variable between a subject with  $N_{patient} = 0$  and a subject with  $N_{patient} = 10$ .

 $<sup>^{35}</sup>$ Recall that we are not interested in the estimated coefficient on  $A_{risk}$ .

 $<sup>^{36}</sup>$ It is noteworthy, however, that the coefficient on  $N_{patient}$  is positive in all but two of the columns in Table 1. The same applies to Male.

 $<sup>^{37}</sup>$ The negative effect of Alt on Foll is somewhat surprising and we are not quite sure what to make of it.

	•
Ľ	$\overline{}$
	- 1

	(	Ĉ		$\widehat{C1}$	$\widehat{L\epsilon}$	$\widehat{en}$	$\widehat{Forg}$		$\widehat{Loyal}$		$\widehat{Lead}$		$\widehat{Fo}$	Ìl
	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD
$A_{risk}$	-0.24**	-0.47***	-0.13	-0.59***	-0.17	-0.16	-0.54	-0.04	0.32	-0.42	-0.16	0.07	-0.36*	-0.79*
	(0.11)	(0.14)	(0.15)	(0.17)	(0.26)	(0.24)	(0.48)	(0.34)	(0.25)	(0.26)	(0.17)	(0.54)	(0.18)	(0.45)
$N_{risky}$	0.01	0.01	0.03	0.01	0.01	0.01	-0.16	-0.01	0.00	0.01	0.02	0.04	-0.03	-0.15*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.10)	(0.08)	(0.03)	(0.02)	(0.03)	(0.08)	(0.04)	(0.08)
$N_{patient}$	0.03**	0.01	0.02	0.01	0.03*	0.04**	0.06*	-0.01	0.02	0.01	-0.01	0.02	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.04)	(0.02)	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)
Trust	-0.00	-0.01	0.02	0.01	-0.02	0.23*	-0.11	-0.30	-0.09	-0.02	0.02	0.48*	-0.04	0.01
	(0.07)	(0.06)	(0.09)	(0.08)	(0.14)	(0.13)	(0.27)	(0.30)	(0.11)	(0.08)	(0.12)	(0.24)	(0.14)	(0.20)
Trustworthy	-0.01	0.05	-0.01	0.08	-0.05	0.01	-0.42*	-0.30	0.03	-0.05	-0.02	-0.03	-0.12	0.12
	(0.07)	(0.07)	(0.10)	(0.09)	(0.12)	(0.13)	(0.22)	(0.25)	(0.10)	(0.09)	(0.11)	(0.22)	(0.13)	(0.16)
Alt	0.01	-0.15	0.17	-0.04	0.11	-0.19	-0.40	0.71**	0.05	0.02	0.04	-1.26***	-0.31*	-0.58*
	(0.09)	(0.10)	(0.11)	(0.12)	(0.17)	(0.18)	(0.50)	(0.25)	(0.12)	(0.10)	(0.25)	(0.39)	(0.18)	(0.34)
Dom	0.06	0.17	0.24	0.33**	0.14	-0.11	-0.55	0.34	-0.08	-0.03	-0.08	0.20	0.21	-0.30
	(0.12)	(0.10)	(0.16)	(0.16)	(0.23)	(0.10)	(0.49)	(0.20)	(0.19)	(0.12)	(0.16)	(0.17)	(0.14)	(0.22)
Str	-0.00	-0.01	0.06	-0.06	-0.07	-0.04	-0.02	0.43	0.02	0.02	0.20*	0.23	0.11	0.11
	(0.06)	(0.06)	(0.08)	(0.08)	(0.11)	(0.15)	(0.24)	(0.29)	(0.10)	(0.09)	(0.12)	(0.19)	(0.12)	(0.20)
FOSD	-0.23*	0.03	-0.04	0.04	-0.42**	0.16	0.11	-0.35	-0.49***	-0.33***	0.00	0.27	-0.41***	0.29
	(0.12)	(0.13)	(0.18)	(0.14)	(0.17)	(0.22)	(0.26)	(0.36)	(0.13)	(0.08)	(0.25)	(0.19)	(0.15)	(0.27)
PA	0.04	-0.01	0.05	-0.08	0.18	0.03	-0.13	0.16	0.12	0.21***	-0.00	0.29	0.08	-0.12
	(0.08)	(0.07)	(0.09)	(0.08)	(0.12)	(0.13)	(0.21)	(0.20)	(0.11)	(0.08)	(0.12)	(0.20)	(0.13)	(0.18)
Male	0.19***	0.15*	0.23**	0.19*	0.10	0.16	0.43*	-0.42	0.21	-0.01	0.02	0.29	0.03	0.08
	(0.07)	(0.08)	(0.10)	(0.10)	(0.13)	(0.16)	(0.23)	(0.27)	(0.15)	(0.10)	(0.12)	(0.18)	(0.11)	(0.16)
Constant	0.30	0.32*	-0.08	0.22	0.45	0.06	1.41	0.84*	0.92***	1.03***	0.28	-0.46	0.73**	1.15**
	(0.19)	(0.19)	(0.27)	(0.24)	(0.37)	(0.29)	(0.83)	(0.42)	(0.30)	(0.20)	(0.34)	(0.49)	(0.30)	(0.49)
Observations	87	87	87	87	70	69	30	32	71	78	64	29	62	42
R-squared	0.25	0.23	0.21	0.19	0.16	0.18	0.48	0.32	0.18	0.23	0.10	0.48	0.23	0.23

Table 1: Regressions of aspects in RMB and RPD on individual characteristics. Robust standard errors in parentheses. \*/\*\*/\*\*\* indicates statistical significance at the 10/5/1 percent level.

	FreqCC	$\overline{FreqCC}$
	(from RMB)	(from RPD)
$A_{risk}^i + A_{risk}^j$	-0.23***	-0.41***
7 65.6	(0.06)	(0.08)
$N_{risky}^i + N_{risky}^j$	0.01	0.01
reality reality	(0.01)	(0.01)
$N_{patient}^i + N_{patient}^j$	0.02***	0.01**
ринет ринет	(0.00)	(0.00)
$Trust^i + Trust^j$	$0.02^{'}$	-0.02
	(0.03)	(0.03)
$Trustworthy^i + Trustworthy^j$	-0.00	0.03
Ţ.	(0.03)	(0.03)
$Alt^i + Alt^j$	0.01	-0.10**
	(0.05)	(0.05)
$Dom^i + Dom^j$	0.07*	0.17***
	(0.05)	(0.04)
$Str^i + Str^j$	-0.02	0.00
	(0.03)	(0.03)
$FOSD^i + FOSD^j$	-0.21***	0.03
	(0.06)	(0.07)
$PA^i + PA^j$	0.05	-0.00
	(0.03)	(0.03)
$Male^i + Male^j$	0.18***	0.15***
	(0.03)	(0.03)
Constant	0.05	-0.10
	(0.18)	(0.18)
Observations	537	534
R-squared	0.16	0.16

Table 2: Regressions of FreqCC in the RMB and RPD on individual characteristics. Robust standard errors in parentheses. \*/\*\*/\*\*\* indicates statistical significance at the 10/5/1 percent level.

superscript i/j indicate that we are referring to i's/j's individual characteristic. (For example,  $N_{risky}^i$  refers to the value of  $N_{risky}$  for i.)

We run the following OLS regression (separately for the RMB and RPD):

$$FreqCC = \beta_0 + \beta_1(A^i_{risk} + A^j_{risk}) + \beta_2(N^i_{risky} + N^j_{risky}) + \beta_3(N^i_{patient} + N^j_{patient}) + \beta_4(Trust^i + Trust^j) + \beta_5(Trustworthy^i + Trustworthy^j) + \beta_6(Alt^i + Alt^j) + \beta_7(Dom^i + Dom^j) + \beta_8(Str^i + Str^j) + \beta_9(FOSD^i + FOSD^j) + \beta_{10}(PA^i + PA^j) + \beta_{11}(Male^i + Male^j) + \varepsilon,$$

where  $\varepsilon$  is the idiosyncratic error term.<sup>38,39</sup>

The first and second columns in Table 2 report the result for the RMB and RPD, respectively. Based on the table, we can state the following result.

**Result 2**  $N_{patient}^l$ ,  $Male^l$ , and  $Dom^l$   $(l \in \{i, j\})$  have a systematic positive effect on FreqCC. No other individual characteristic variable (except for  $A_{risk}^l$ ,  $l \in \{i, j\}$ ) has a systematic effect on FreqCC.

In the RMB/RPD, FreqCC increases (i) by 0.2/0.1 if one replaces an impatient player for whom  $N_{patient} = 0$  with a patient player for whom  $N_{patient} = 10$ , (ii) by 0.18/0.15 if one replaces a female player with a male one, and (iii) by 0.07/0.17 if one replaces a player who does not choose a dominant strategy in a one-shot matrix game with a player who does. These effects are not only statistically, but also economically significant.<sup>40</sup> However,  $N_{risky}$ , Trust, Trustworthy, Alt, Str, FOSD and PA have no systematic effects on FreqCC.

	Earnings	Earnings
	(from RMB)	(from RPD)
$A_{risk}$	0.01	-1.36***
	(0.35)	(0.35)
$N_{risky}$	0.12**	0.03
	(0.06)	(0.07)
$N_{patient}$	0.02	-0.00
•	(0.03)	(0.03)
Trust	0.11	-0.24
	(0.19)	(0.18)
Trustworthy	0.01	0.28
	(0.19)	(0.19)
Alt	-0.32	-0.54*
	(0.30)	(0.31)
Dom	-0.01	0.82***
	(0.35)	(0.28)
Str	-0.04	0.05
	(0.18)	(0.20)
FOSD	-0.51	0.21
	(0.58)	(0.48)
PA	0.25	-0.10
	(0.21)	(0.20)
Male	0.33*	0.39*
	(0.19)	(0.22)
Constant	6.91***	7.94***
	(0.70)	(0.66)
Observations	87	87
R-squared	0.14	0.25

Table 3: Regressions of individual earnings (in USD) in RMB and RPD on individual characteristics. Robust standard errors in parentheses. \*/\*\*/\*\*\* indicates statistical significance at the 10/5/1 percent level.

### 5.3 Individual Characteristics and Individual Profits

The first and second columns in Table 3 report the results from OLS regressions of *Earnings*—a subject's earnings (in USD) in the RMB and RPD games, respectively—on the individual characteristics variables. Based on the table, we can state:

**Result 3** Male has a systematic positive effect on earnings. No other individual characteristic variable has a systematic effect on earnings.

### 5.4 Testing Multiple Hypotheses

As mentioned earlier, if one estimates many coefficients (as we do), some are likely to turn out statistically significant by fluke. This is the well-known problem with testing multiple hypotheses.<sup>41</sup> A particular danger is that a researcher can guarantee herself statistically significant findings simply by including sufficiently many independent variables in her regressions or by running sufficiently many regressions.

Although some of our statistically significant results might indeed be false positives due to the number of estimated coefficients, we believe the problem is limited in our study. First, as explained in section 4, there is a clear logic for including the particular individual characteristics in our study. Second, as explained earlier, we try to limit the danger of false positives by focusing on coefficients that are statistically significant in both the RMB and RPD. Third, our statistically significant results regarding *Male* are consistent with the findings of Dreber, Fudenberg, and Rand (2011) and, hence, are probably quite reliable. Fourth, the main punch line of our study is the paucity of

 $<sup>^{38}</sup>$ Given that which subject is i and which j is arbitrary, the regression above implicitly imposes the natural assumption that the coefficient on a given individual characteristics variable for i and the coefficient on the same individual characteristics variable for j are the same.

<sup>&</sup>lt;sup>39</sup>Given that each subject plays the same repeated game for several matches, each time against different opponents, there are complicated dependencies between matches. The OLS regression ignores such dependencies, so that the statistical significance of the estimated coefficients should be treated with caution.

 $<sup>^{40}</sup>$ To better appreciate the magnitude of these effects, note that the average value of FreqCC is 0.35 and 0.63 in the RMB and RPD, respectively.

 $<sup>^{41}</sup>$ E.g., in Table 1 there are 140 coefficients that are of interest. (The coefficients on  $A_{risk}$  and the constant terms are not of interest.) A common approach to dealing with the multiple-hypotheses problem is to make a Bonferroni adjustment. However, it is well known that this adjustment is excessively conservative when one is testing a large number of hypotheses. For the estimates in Table 1, a Bonferroni adjustment would require that we consider significant only coefficients that have a p-value below 0.05/140. This seems impractically stringent.

statistically significant relationships. If anything, testing multiple hypotheses stacks the deck against such a conclusion.

# 6 Concluding Remarks

In the current paper, we investigate the relationship between several individual characteristics that are popular in economics and behavior in repeated games. We do find some evidence of systematic relationships. The two individual characteristics that stand out are patience and gender—these seem to have some effect on behavior both at the individual and at the pair level. However, overall, the number of systematic relationships is surprisingly small.

Although game theory provides no guidance regarding how individual characteristics might be related to behavior in indefinitely repeated games, our intuitive expectation was that, at a minimum, patience, trust, trustworthiness, altruism, and an ability to plan ahead would be strongly positively related to most aspects and, possibly, to the frequency of the CC outcome. Instead, we find that trust, trustworthiness, and an ability to plan ahead have no effect on behavior both at the individual and at the pair level; altruism has no effect at the pair level and has the opposite from the expected effect at the individual level. Patience affects only one aspect (Len) at the individual level. Attitude to risk and strategic thinking in one-shot matrix games (as captured through Str) also seem to have no effect on behavior both at the individual and at the pair level. Overall, our data indicate that behavior in repeated games is driven by factors that are largely independent of many of the individual characteristics we consider.

In conclusion, we view our study as taking a step towards answering some interesting questions about the connections (or lack thereof) between individual characteristics and behavior in repeated games. It is definitely not the final word on the matter. To make sure that our statistically significant results are not false positives due to the fact that we estimate many coefficients, one needs to confirm these results in further studies. To reduce the possibility of measurement error in eliciting the individual characteristics, one might employ multiple tasks to elicit each characteristic (possibly focusing on fewer individual characteristics due to time constraints).

Finally, one needs to investigate whether our results extend to other repeated games.

## 7 References

Al-Ubaydli, O., G. Jones and J. Weel (2013). "Patience, cognitive skill and coordination in the repeated stag hunt," *Journal of Neuroscience, Psychology and Economics*, 6(2)

Al-Ubaydli, O., G. Jones and J. Weel (2014). "Average player traits as predictors of cooperation in a repeated prisoner's dilemma," Working paper

Bone, John, John D. Hey, and John Suckling (2009). "Do People Plan," *Experimental Economics*, 12, pp.12-25

Borghans, L., A. Duckworth, J. Heckman and B. Weel (2008). "The economics and psychology of personality traits," *Journal of Human Resources*, 43, pp. 972-1059.

Cabral, Luis, Erkut Y. Ozbay, and Andrew Schotter (2012). "Intrinsic and Instrumental Reciprocity: An Experimental Study," working paper

Costa-Gomes, Miguel, Vincent P. Crawford, and Bruno Broseta (2001). "Cognition and Behavior in Normal-Form Games: An Experimental Study," *Econometrica*, 69(5), pp.1193-1235

Dal Bó, Pedro and Guillaume R. Fréchette (2011a). "The Evolution of Cooperation in Infinitely Repeated Games: Experimental Evidence," *American Economic Review*, 101(1): 411-429

Dal Bó, Pedro and Guillaume R. Fréchette (2011b). "Strategy Choice In The Infinitely Repeated Prisoners Dilemma," Working Paper

Davis, Douglas, Asen Ivanov, and Oleg Korenok (2013). "Aspects of Behavior in

Repeated Games: An Experimental Study," Working Paper

Davis, Douglas, Oleg Korenok, and Robert Reilly (2010). "Cooperation without coordination: signaling, types and tacit collusion in laboratory oligopolies," *Experimental Economics*, vol. 13(1), pp. 45-65

Dolbear Jr., F. Trenery and Lester B. Lave (1966). "Risk Orientation as a Predictor in the Prisoner's Dilemma," *The Journal of Conflict Resolution*, 10(4), pp. 506-515

Dreber, Anna, Drew Fudenberg, and David G. Rand (2011). "Who Cooperates in Repeated Games," working paper.

Drouvelis, Michalis and Julian C. Jamison (2012). "Selecting Public Good Institutions: Who Likes to Punish and Reward?," Federal Reserve Bank of Boston working paper

Engle-Warnick, Jim and Robert L. Slonim (2006). "Inferring Repeated-Game Strategies from Actions: Evidence from Trust Game Experiments," *Economic Theory*, 28(3): 60332.

Fischbacher, Urs (2007). "z-Tree: Zurich Toolbox for Ready-made Economic Experiments," *Experimental Economics*, 10(2), pp. 171-178.

Holt, Charles A. and Susan K. Laury (2002). "Risk Aversion and Incentive Effects," *American Economic Review*, 92(5), pp.1644-1655

Kimbrough, Erik O. and Alexander Vostroknutov (2013). "Norms Make Preferences Social," working paper

Kurzban, Robert and Daniel Houser (2001). "Individual Differences in Cooperation in a Circular Public Goods Game," European Journal of Personality, 15, 37-52

Reuben, Ernesto and Sigrid Suetens (2012). "Revisiting strategic versus non-strategic cooperation," Experimental Economics, 15, pp.2443

Sabater-Grande, Gerardo and Nikolaos Georgantzis (2002). "Accounting for risk aversion in repeated prisoners' dilemma games: an experimental test," *Journal of Economic Behavior & Organization*, 48, 3750

# 8 Appendix: Subjects' Forecasts

As mentioned in footnote 12, in each round of a given repeated game subjects also had to forecast the current-round choice of the other player.<sup>42</sup> Our primary concern in this paper is to study the possible effects of individual characteristics on behavior in repeated games. However, it may be insightful to further break down these effects by considering the following three questions:

- 1. Do individual characteristics affect subjects' forecasts?
- 2. Are subjects' forecasts related to their behavior?
- 3. How do our results in Table 1 change if we control for subjects' forecasts in the regressions?

To address these questions, one needs to somehow quantify each subject's forecasts. We do so in a way that parallels how we quantified subjects' behavior through our aspects. In particular, we define the following summary measures of the forecasts of a given subject i who is matched with another subject j to play an RPD.

•  $\widehat{C1}_F$ : the frequency with which i forecasts (that j will play) C in round 1. Thus,  $\widehat{C1}_F$  captures i's forecasts when she is deciding how to start off the game.

 $<sup>^{42}</sup>$ This is a crude measure of each subject's belief about the other player's behavior for two reasons. First, a subject i may hold nondegenerate beliefs about the current-round choice of the other player j. Second, more importantly, i's full belief is not just about j's current-round choice, but about j's behavior at any possible future history.

- $\widehat{Len}_F$ : the frequency with which i forecasts C at history (CD). Thus,  $\widehat{Len}_F$  captures i's forecasts when she is deciding whether to be lenient.
- $\widehat{Forg}_F$ : the frequency with which *i* forecasts C at history (CD,DC). Thus,  $\widehat{Forg}_F$  captures *i*'s forecasts when she is deciding whether to be forgiving.
- $\widehat{Loyal}_F$ : the frequency with which i is not weakly first to forecast D in a game that starts out with (CC). <sup>43,44</sup> Thus,  $\widehat{Loyal}_F$  is about a subject's propensity to be the first one to suspect that the other will defect in a game in which i needs to decide whether to be loval.
- $\widehat{Lead}_F$ : the frequency with which i is weakly first to forecast C in a game that starts out with (DD).<sup>45</sup> Thus,  $\widehat{Lead}_F$  is about a subject's propensity to be the first one to expect that the other will cooperate in a game in which i needs to decide whether to lead.
- $\widehat{Foll}_F$ : the frequency with which i plays C at history (DC). Thus,  $\widehat{Foll}_F$  captures i's forecasts when she is deciding whether to follow j in cooperating.
- $\widehat{C}_F$ : the overall frequency with which i forecasts that j will play C.

In the RMB game, we define these measures exactly as above except that we take "C" to stand for "H" and "D" to stand for "L" or "M."

We are now ready to address the three questions above. To address the first question, we run the analogues of the regressions presented in Table 1 with each independent variable replaced by the corresponding variable defined above. The results are presented in Table 4. Based on the Table, we see that only Male has a systematic positive effect on  $\widehat{C}_F$ . Thus, individual characteristics are even less useful for predicting subjects' forecasts than they are for predicting subjects' behavior in repeated games.

<sup>&</sup>lt;sup>43</sup>Conditional on the game having at least two rounds.

<sup>&</sup>lt;sup>44</sup> "weakly first" allows the possibility that both players forecast D simultaneously.

<sup>&</sup>lt;sup>45</sup>Conditional on the game having at least two rounds.

_	-
~	٠,
·	$\sim$

	Ó	$\widehat{\mathcal{I}}_F$	Ó	$\widehat{C1}_F$	$\widehat{Le}$	$n_F$	$\widehat{Fo}$	$rg_F$	Log	$al_F$	$\widehat{L\epsilon}$	$\widehat{ead}_F$	$\widehat{Fol}$	$\hat{l}_F$
	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD
$A_{risk}$	-0.19**	-0.41***	-0.21*	-0.28	-0.15	-0.79***	-0.02	-0.07	0.76***	-0.34*	0.06	-0.17	-0.20	-0.34
	(0.09)	(0.12)	(0.11)	(0.23)	(0.22)	(0.19)	(0.32)	(0.33)	(0.22)	(0.17)	(0.26)	(0.17)	(0.33)	(0.36)
$N_{risky}$	0.02	0.02	0.03	0.02**	0.01	-0.02	-0.03	0.10	0.05	0.06***	0.06	0.02	-0.01	0.01
	(0.01)	(0.01)	(0.02)	(0.01)	(0.03)	(0.02)	(0.07)	(0.06)	(0.03)	(0.02)	(0.04)	(0.05)	(0.03)	(0.07)
$N_{patient}$	0.02**	0.01	-0.00	-0.01	0.00	0.00	0.05*	-0.02	-0.00	-0.01	-0.02	-0.00	0.03**	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Trust	0.01	0.00	0.03	-0.06	-0.11	-0.01	0.12	0.37	0.09	-0.08	0.12	0.04	-0.09	-0.30*
	(0.05)	(0.04)	(0.08)	(0.06)	(0.12)	(0.10)	(0.17)	(0.23)	(0.11)	(0.07)	(0.11)	(0.11)	(0.13)	(0.17)
Trustworthy	-0.02	0.05	0.02	0.01	-0.11	0.32***	-0.41*	-0.29	0.01	0.06	0.05	0.04	-0.25**	-0.02
	(0.05)	(0.05)	(0.08)	(0.04)	(0.11)	(0.10)	(0.22)	(0.19)	(0.11)	(0.07)	(0.11)	(0.06)	(0.11)	(0.17)
Alt	0.03	-0.13	0.15	-0.02	0.06	-0.07	-0.62	-0.61**	0.08	-0.02	-0.08	-0.72**	0.08	0.05
	(0.07)	(0.08)	(0.10)	(0.07)	(0.15)	(0.16)	(0.40)	(0.23)	(0.16)	(0.08)	(0.18)	(0.32)	(0.15)	(0.21)
Dom	-0.02	0.13	0.02	0.09	-0.19	-0.23*	-0.55	-0.49**	-0.07	0.07	-0.11	0.13	-0.04	-0.14
	(0.09)	(0.08)	(0.12)	(0.11)	(0.20)	(0.12)	(0.45)	(0.18)	(0.17)	(0.19)	(0.11)	(0.11)	(0.12)	(0.15)
Str	0.00	-0.03	0.07	-0.06	-0.05	-0.13	-0.04	-0.22	-0.05	-0.06	0.12	-0.02	-0.10	-0.17
	(0.04)	(0.04)	(0.07)	(0.06)	(0.10)	(0.11)	(0.18)	(0.25)	(0.10)	(0.07)	(0.10)	(0.07)	(0.10)	(0.12)
FOSD	-0.12	-0.01	0.29	0.02	-0.47***	0.08	0.46**	-0.36	-0.11	-0.15*	0.35	0.03	-0.16	0.50
	(0.11)	(0.09)	(0.19)	(0.08)	(0.16)	(0.16)	(0.19)	(0.26)	(0.25)	(0.08)	(0.27)	(0.09)	(0.17)	(0.31)
PA	0.01	-0.05	-0.04	-0.04	0.12	-0.15	-0.10	0.14	0.06	-0.00	0.07	0.00	-0.06	-0.12
	(0.06)	(0.05)	(0.08)	(0.05)	(0.11)	(0.12)	(0.21)	(0.19)	(0.10)	(0.07)	(0.13)	(0.04)	(0.09)	(0.11)
Male	0.14**	0.15**	0.09	0.03	0.15	0.14	0.58***	-0.11	0.01	0.13	-0.01	0.01	-0.02	0.11
	(0.06)	(0.06)	(0.09)	(0.05)	(0.13)	(0.13)	(0.20)	(0.23)	(0.13)	(0.09)	(0.10)	(0.05)	(0.10)	(0.12)
Constant	0.40**	0.49***	0.15	0.83***	0.98***	0.80***	0.51	1.43***	0.40	0.62**	0.15	0.87***	0.89***	0.52
	(0.16)	(0.14)	(0.24)	(0.17)	(0.34)	(0.26)	(0.61)	(0.37)	(0.36)	(0.27)	(0.29)	(0.21)	(0.29)	(0.48)
Observations	87	87	87	87	70	69	30	32	71	78	64	29	62	42
R-squared	0.23	0.29	0.13	0.14	0.16	0.22	0.60	0.43	0.11	0.25	0.18	0.65	0.21	0.33

Table 4: Regressions of variables summarizing subjects' forecasts in RMB and RPD on individual characteristics. Robust standard errors in parentheses. \*/\*\*/\*\*\* indicates statistical significance at the 10/5/1 percent level.

Correlation between	RMB	RPD
$\widehat{C}$ and $\widehat{C}_F$	0.927***	0.912***
$\widehat{C1}$ and $\widehat{C1}_F$	0.533***	0.198*
$\widehat{Len}$ and $\widehat{Len}_F$	0.687***	0.438***
$\widehat{Forg}$ and $\widehat{Forg}_F$	0.744***	0.509***
$\widehat{Loyal}$ and $\widehat{Loyal}_F$	0.614***	0.49***
$\widehat{Lead}$ and $\widehat{Lead}_F$	0.425***	0.228
$\widehat{Foll}$ and $\widehat{Foll}_F$	0.45***	0.345**

Table 5: Correlations between each aspect and the corresponding variable summarizing forecasts. \*/\*\*/\*\*\* indicates statistical significance at the 10/5/1 percent level.

Turning to the second question, we look at the correlations between each aspect and the corresponding variable summarizing forecasts.<sup>46</sup> These correlations are presented in Table 5. Based on the Table, we see that, with minor exceptions, these correlations are quite large and statistically significant. However, except for the correlation between  $\widehat{C}$  and  $\widehat{C}_F$  in both the RMB and RPD, they are far from perfect.<sup>47</sup>

To address the third question, we rerun the regressions from Table 1 by adding the relevant measure of forecasts as a control variable. E.g., in the regressions with  $\widehat{C}$  as left-hand side variable, we add  $\widehat{C}_F$  as a control. By way of notation, in a regression with  $\widehat{C}/\widehat{C1}/\widehat{Len}/\widehat{Forg}/\widehat{Loyal}/\widehat{Lead}/\widehat{Foll}$  as left-hand-side variable, let Control denote  $\widehat{C}_F/\widehat{C1}_F/\widehat{Len}_F/\widehat{Forg}_F/\widehat{Loyal}_F/\widehat{Lead}_F/\widehat{Foll}_F$ . The results are presented in Table 6. Note that, based on the Table, Result 1 does not change much when we control for forecasts. The only differences in Table 6 from Table 1 are the following: (i)  $N_{patient}$  now also has a systematic positive effect on  $\widehat{C}$ , (ii) Dom has a systematic positive effect on  $\widehat{C}$ , (iii) Male loses its systematic positive effect on  $\widehat{C}$ . Note that (i) and (ii) are not due to differences in the estimated coefficients. Rather their standard errors change just enough in one of the repeated games for the effect to qualify as

 $<sup>^{46}</sup>$ Except for the correlation between  $\widehat{Lead}$  and  $\widehat{Lead}_F$ , our ex ante expectation was that all other correlations would be positive. In the case of  $\widehat{Lead}$  and  $\widehat{Lead}_F$ , it is not clear what the correlation should be because it is not clear whether expecting the other player to take the initiative and break a streak of mutual defections should make oneself more or less likely to play C.

<sup>&</sup>lt;sup>47</sup>The correlation between  $\widehat{C}$  and  $\widehat{C}_F$  in both the RMB and RPD is this high because, in many games, subjects fall into a long sequence of mutual cooperation or mutual defection. In such games, actions and forecasts coincide almost perfectly.

# 9 Appendix: Summary Statistics for Individual Characteristics and Aspects

<sup>&</sup>lt;sup>48</sup>We should note that our results based on Table 1 stand regardless of whether they do or do not change when we control for forecasts. If, say, a particular individual characteristic affects behavior in repeated games, this result stands on its own feet (and is what is of primary interest) whether or not the effect is mediated by forecasts or not. On the other hand, if a particular individual characteristic does not affect behavior in repeated games, this result also stands on its own feet (and is what is of primary interest) even if a significant effect appears once one controls for forecasts.

	$\widehat{C}$	F	$\widehat{C}$	$\hat{1}_F$	$\widehat{Le}$	$n_F$	$\widetilde{Fe}$	$\widehat{rg_F}$	Log	$jal_F$	Ĺe	$\widehat{ead}_F$	$\widehat{Fol}$	$\overline{l}_F$
	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD	RMB	RPD
$A_{risk}$	-0.01	0.03	-0.01	-0.54***	-0.06	0.31	-0.52	0.02	-0.21	-0.24	-0.18	-0.09	-0.25	-0.65
	(0.07)	(0.05)	(0.14)	(0.18)	(0.19)	(0.23)	(0.37)	(0.19)	(0.17)	(0.21)	(0.16)	(0.50)	(0.27)	(0.39)
$N_{risky}$	-0.01	-0.01	0.01	0.01	0.01	0.02	-0.15	-0.10*	-0.03	-0.02	-0.00	0.06	-0.02	-0.15*
-	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.08)	(0.05)	(0.02)	(0.02)	(0.04)	(0.07)	(0.04)	(0.08)
$N_{patient}$	0.01*	0.01**	0.02*	0.01	0.03*	0.04***	0.02	0.01	0.02	0.02*	0.00	0.02	-0.00	0.01
_	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)
Trust	-0.01	-0.01	0.00	0.02	0.06	0.23*	-0.19	-0.64***	-0.15**	0.02	-0.02	0.52**	0.02	0.14
	(0.03)	(0.03)	(0.07)	(0.09)	(0.08)	(0.12)	(0.23)	(0.17)	(0.06)	(0.08)	(0.12)	(0.24)	(0.10)	(0.21)
Trustworthy	0.01	-0.01	-0.02	0.08	0.03	-0.18	-0.15	-0.04	0.02	-0.08	-0.04	0.00	0.03	0.12
	(0.02)	(0.03)	(0.08)	(0.09)	(0.07)	(0.12)	(0.24)	(0.16)	(0.08)	(0.08)	(0.10)	(0.23)	(0.11)	(0.15)
Alt	-0.03	0.01	0.08	-0.04	0.07	-0.15	0.01	1.27***	-0.00	0.03	0.06	-1.92***	-0.36**	-0.60*
	(0.04)	(0.03)	(0.11)	(0.12)	(0.13)	(0.14)	(0.31)	(0.15)	(0.10)	(0.09)	(0.28)	(0.53)	(0.17)	(0.33)
Dom	0.09***	0.01	0.22*	0.31*	0.27*	0.03	-0.19	0.78***	-0.03	-0.07	-0.04	0.33**	0.23*	-0.24
	(0.03)	(0.03)	(0.13)	(0.16)	(0.16)	(0.12)	(0.28)	(0.15)	(0.11)	(0.08)	(0.16)	(0.15)	(0.13)	(0.22)
Str	-0.01	0.03	0.02	-0.05	-0.03	0.04	0.01	0.62**	0.05	0.05	0.15	0.21	0.17	0.18
	(0.02)	(0.02)	(0.08)	(0.08)	(0.09)	(0.12)	(0.19)	(0.22)	(0.08)	(0.08)	(0.10)	(0.19)	(0.11)	(0.19)
FOSD	-0.10***	0.04	-0.21	0.04	-0.09	0.11	-0.20	-0.02	-0.41***	-0.25***	-0.13	0.30	-0.31**	0.07
	(0.03)	(0.10)	(0.13)	(0.14)	(0.10)	(0.22)	(0.26)	(0.22)	(0.12)	(0.06)	(0.22)	(0.20)	(0.13)	(0.37)
PA	0.03	0.05**	0.07	-0.07	0.09	0.12	-0.07	0.03	0.08	0.21***	-0.03	0.29	0.12	-0.07
	(0.03)	(0.02)	(0.08)	(0.09)	(0.10)	(0.10)	(0.14)	(0.11)	(0.08)	(0.07)	(0.11)	(0.21)	(0.11)	(0.18)
Male	0.02	-0.02	0.18*	0.19*	-0.01	0.08	0.05	-0.32**	0.21**	-0.08	0.02	0.30	0.04	0.03
	(0.03)	(0.03)	(0.09)	(0.11)	(0.08)	(0.13)	(0.23)	(0.14)	(0.10)	(0.09)	(0.10)	(0.18)	(0.10)	(0.14)
Control	1.17***	1.21***	0.57***	0.20	0.70***	0.60***	0.66**	0.91***	0.69***	0.54***	0.37**	-0.91**	0.58***	0.43*
	(0.05)	(0.06)	(0.13)	(0.19)	(0.12)	(0.14)	(0.28)	(0.14)	(0.11)	(0.15)	(0.14)	(0.38)	(0.13)	(0.23)
Constant	-0.17**	-0.28**	-0.16	0.06	-0.24	-0.43	1.07	-0.45	0.64***	0.70***	0.23	0.33	0.21	0.92
	(0.07)	(0.12)	(0.20)	(0.28)	(0.25)	(0.32)	(0.65)	(0.48)	(0.22)	(0.19)	(0.33)	(0.67)	(0.26)	(0.63)
Observations	87	87	87	87	70	69	30	32	71	78	64	29	62	42
R-squared	0.89	0.85	0.41	0.20	0.54	0.37	0.65	0.77	0.56	0.39	0.22	0.53	0.42	0.32

Table 6: Regressions of aspects in RMB and RPD on individual characteristics, controlling for forecasts. Robust standard errors in parentheses. \*/\*\*/\*\*\* indicates statistical significance at the 10/5/1 percent level.

$\overline{A_{risk}}$	0.02 (0.15)
$N_{risky}$	3.74(1.51)
$N_{patient}$	5.29(3.33)
Trust	0.37(0.49)
Trustworthy	0.47(0.50)
Alt	0.26 (0.29)
Dom	0.90(0.31)
Str	0.32(0.47)
FOSD	0.95(0.21)
PA	0.45(0.50)
Male	0.72(0.45)

Table 7: Individual characteristics averages across subjects. Sample standard errors in parentheses.

		$A_{risk}$	$N_{risky}$	$N_{patient}$	Trust	Trustworthy	Alt	Dom	Str	FOSD	PA	Male
	$A_{risk}$	1										
	$N_{risky}$	-0.38***	1									
	$N_{patient}$	0.01	0.22**	1								
	Trust	-0.12	0.06	-0.18*	1							
	Trustworthy	0.16	-0.14	0.09	0.33***	1						
	Alt	-0.09	0.06	0.13	0.13	0.15	1					
36	Dom	0.05	-0.19*	-0.05	-0.13	0.02	-0.13	1				
	Str	-0.11	0.12	0.05	-0.12	-0.06	-0.20*	0.15	1			
	FOSD	0.03	-0.00	0.14	-0.17	-0.23**	-0.01	-0.08	0.03	1		
	PA	-0.14	-0.06	0.12	-0.21*	0.03	0.03	-0.15	0.02	0.20*	1	
	Male	-0.08	0.08	-0.11	-0.01	-0.19*	0.06	-0.04	0.15	0.11	0.30***	1

Table 8: Correlations between individual characteristics. \*/\*\*/\*\*\* indicates statistical significance at the 10/5/1 percent level.

		F	RMB		RPD			
	Matches	Matches	Matches	correlation	Matches	Matches	Matches	correlation
	1-7	8-13	1-13	between	1-7	8-13	1-13	between
				matches				matches
				1-7  and  8-13				1-7  and  8-13
$\widehat{C1}$	0.53	0.61	0.57	0.77***	0.74	0.80	0.77	0.74***
	(0.39)	(0.43)	(0.38)		(0.37)	(0.37)	(0.35)	
$\widehat{Len}$	0.56	0.51	0.49	0.59***	0.59	0.54	0.56	0.68***
	(0.42)	(0.46)	(0.41)		(0.46)	(0.49)	(0.45)	
$\widehat{Forg}$	0.50	0.63	0.56	0.37	0.61	0.70	0.64	0.62**
_	(0.5)	(0.5)	(0.48)		(0.5)	(0.47)	(0.49)	
$\widehat{Loyal}$	0.76	0.77	0.73	0.7***	0.85	0.85	0.81	0.66***
-	(0.38)	(0.38)	(0.39)		(0.29)	(0.28)	(0.32)	ĺ
$\widehat{Lead}$	0.32	0.32	0.33	0.53***	0.50	0.27	0.50	0.3
	(0.37)	(0.41)	(0.36)		(0.46)	(0.44)	(0.43)	
$\widehat{Foll}$	0.36	0.44	0.42	0.52***	0.59	0.61	0.60	0.86***
	(0.42)	(0.46)	(0.40)		(0.44)	(0.46)	(0.44)	ĺ
$\widehat{C}$	0.41	0.50	0.46	0.72***	0.67	0.70	0.68	0.64***
	(0.28)	(0.3)	(0.27)		(0.27)	(0.28)	(0.25)	

Table 9: Aspect averages across subjects for matches 1-7, 8-13, and 1-13 (with sample standard errors in parentheses) as well as aspect correlations between matches 1-7 and 8-13 (\*/\*\*/\*\*\* indicates statistical significance at the 10/5/1 percent level).

### **Instructions for Session 1**

Welcome! This is an experiment in decision-making. Funding for this experiment has been provided by the National Science Foundation and Virginia Commonwealth University. The experiment consists of two sessions—one today and one next week. You are required to participate in both sessions. Each session is expected to last up to 2 hours.

For today's session, you will receive a \$6 show-up fee. In addition, you will have the opportunity to earn Experimental Currency Units (ECU). ECU will be converted into dollars at a rate of 500 ECU=\$1. Thus, your earnings in today's session will equal:

$$$6 + \frac{1}{500}$$
 (ECU earned in today's session)

You will receive only \$10 in cash at the end of today's session. The remainder of your earnings from today's session will be paid to you at the end of next week's session. Note that you need to show up punctually for next week's session. If you fail to do so, any earnings from today's session over and above \$10 will be lost. If you do show up punctually for next week's session, you will:

- be paid the remainder of your earnings from today's session;
- receive a \$6 show-up fee for attending next week's session;
- have the opportunity to earn more money during next week's session.

Note that your decisions are likely to considerably affect your earnings. If you follow the instructions carefully and make good decisions, you can earn a considerable amount of money.

**Caution:** This is a serious experiment and talking, looking at others' screens, or exclaiming aloud are not allowed. Should you have any questions please raise your hand and an experimenter will come to you.

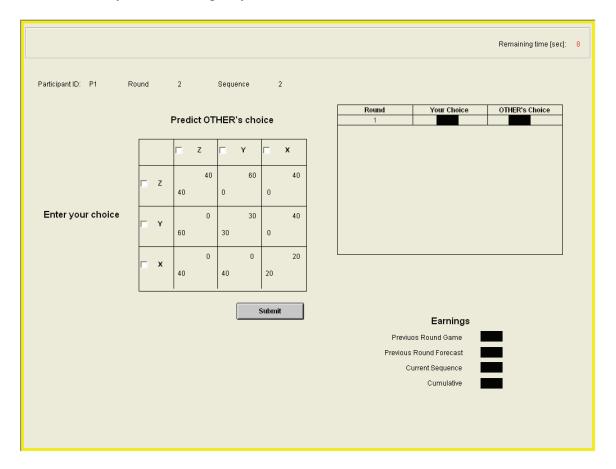
### 1. Session Structure

Today's session is divided into a series of *sequences*. A *sequence* will consist of an indefinite number of *rounds*. At the beginning of each sequence, you will be matched with someone else in this room. You will remain matched with this same person for every round in the sequence. We will refer to the person you are matched with in a given sequence as OTHER.

# 2. Tasks in each round

In each round, you and OTHER will play the game shown below. In this game, each of you can make any one of three choices: X, Y or Z. You and OTHER will make your choices simultaneously without knowing each other's choice.

In each round, you must also give your best forecast of what OTHER will choose.



### 3. Earnings in each round

The ECU you earn in a round are determined based on the combination of your decision and OTHER's decision. This combination determines a box in the table. Your earnings are listed in the lower left hand corner of the box. OTHER's earnings are listed in the upper right corner.

In addition, remember that you will also need to give your best forecast of OTHER's choice. We will pay you 5 ECU if this forecast is correct.

# 4. Earnings for each sequence and for the session

The earnings for a sequence will equal the sum of the earnings from all rounds within the sequence. Your earnings for the session will equal the sum of the earnings from all sequences (plus the show-up fee).

## 5. Information on the screen

In the upper-right corner of the screen, there will be a table showing the decisions you and OTHER made in previous rounds of the current sequence.

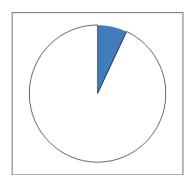
In the lower-right corner, you can see:

- your earnings from the combination of your decision and OTHER's decision in the previous round;
- your earnings from your forecast of OTHER's decision in the previous round;
- your earnings from all previous rounds of the current sequence;
- your cumulative earnings from the session so far (excluding your show-up fee).

### 6. Length of sequence

The number of rounds in a sequence will be determined randomly. In particular, after each round there is a 93% probability that the sequence continues and a 7% probability that the sequence ends. After a sequence ends, a new sequence is started.

One way to understand the above probabilities is to imagine that after each round the computer "spins a roulette wheel" like the one shown below. If the ball lands in the white area, the sequence continues; if it lands in the dark area, the sequence ends.



Note that after each round the probability of continuation is always 93%. In other words, regardless of whether the sequence just started or whether it has been going on for multiple rounds, the probability of continuation is always 93%.

### 7. Random re-matching

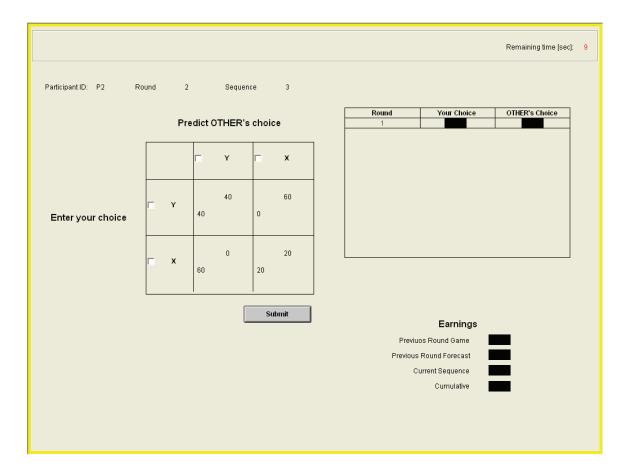
At the beginning of each new sequence, you are randomly re-matched with another person. This person will be different from the person you were matched with in the previous sequence.

### 8. Decision time

In each round, you will have 10 seconds to choose X, Y, or Z and to make your forecast of OTHER's choice. Please do not take longer than that.

# 9. Another game

In later sequences, the game played will change to the one shown in the screenshot below. Everything else remains the same as with the previous game.



Any questions?

# Questionnaire:

Prior to beginning please answer the following questions:

First, suppose you are playing the first game shown above.

1.	If you choose X and OTHER chooses X, you will earn will earn ECU.	ECU and OTHER
2.	If you choose X and OTHER chooses Y, you will earn will earn ECU.	ECU and OTHER
3.	If you choose X and OTHER chooses Z, you will earn will earn ECU.	ECU and OTHER
4.	If you choose Y and OTHER chooses X, you will earn will earn ECU.	ECU and OTHER
5.	If you choose Y and OTHER chooses Y, you will earn will earn ECU.	ECU and OTHER
6.	If you choose Y and OTHER chooses Z, you will earn will earn ECU.	ECU and OTHER
7.	If you choose Z and OTHER chooses X, you will earn will earn ECU.	ECU and OTHER
8.	If you choose Z and OTHER chooses Y, you will earn will earn ECU.	ECU and OTHER
9.	If you choose Z and OTHER chooses Z, you will earn will earn ECU.	ECU and OTHER
10.	If your forecast is that OTHER will choose Z and OTHER actu you will earn ECU for your forecast.	ually chooses X,
Second	d, suppose you are playing the second game shown above.	
1.	If you choose X and OTHER chooses X, you will earn will earn ECU.	ECU and OTHER
2.	If you choose X and OTHER chooses Y, you will earn will earn ECU.	ECU and OTHER
3.	If you choose Y and OTHER chooses X, you will earn will earn ECU.	ECU and OTHER
4.	If you choose Y and OTHER chooses Y, you will earn will earn ECU.	ECU and OTHER
5.	If your forecast is that OTHER will choose Y and OTHER act you will earn ECU for your forecast.	ually chooses Y,

# Any questions?

Let's proceed with a practice sequence. In this practice sequence, you are not playing for real money. Also, you will be given longer to make your decisions in each round.

### **Instructions for Session 2**

Welcome! Last week, you participated in the first session of the experiment. Today's session is the second (and final) session of the experiment. Today's session is expected to last up to 2 hours.

For today's session, you will receive a \$6 show-up fee. In addition, you will have the opportunity to earn money during the session.

At the end of today's session, you will be paid the following: (i) your earnings from last week's session over and above the \$10 you received last week (ii) your \$6 show-up fee for today's session, and (iii) earnings from your decisions in today's session. We note, however, that for one of the tasks in today's session, you may choose to be paid at a later date.

Note that your decisions are likely to considerably affect your earnings. If you follow the instructions carefully and make good decisions, you can earn a considerable amount of money.

**Caution:** This is a serious experiment and talking, looking at others' screens, or exclaiming aloud are not allowed. Should you have any questions please raise your hand and an experimenter will come to you.

# Overview of today's session:

Today's session will consist of six different tasks. You will perform these tasks one after the other. For each task, we will read the appropriate instructions after which you will be given the opportunity to ask questions, complete a short understanding quiz, and then make decisions.

At the end of today's session, one of the tasks will be used for payment. The task that will determine your payment will be selected randomly, and each task has an equal chance of being picked. Keep in mind that because you won't know until the end of the session which task will be used for payment, it is in your best interest to make careful decisions in each task.

#### Task 1

In this task, participants are randomly divided into two groups—Row participants and Column participants. Each of you will be randomly matched with another participant whom we refer to as OTHER. This matching will be anonymous—no one will ever find out who they were matched with.

Each of you will be presented with 2 decision situations. Your earnings in a decision situation will depend not only on your decision but also on the decision OTHER made. You and OTHER will make your decisions simultaneously without being told each other's decision.

Each decision situation will be presented in the form of a table like the following one (the numbers in the table and the size of the table will differ for each decision situation):

	LEFT	CENTER	RIGHT
UP	23	12	18
OI	11	31	22
DOWN	7	21	16
DOWN	23	6	12

If you are a Row participant you will have to choose a row, i.e. in the case of the decision situation above UP or DOWN. If you are a Column participant you will have to choose a column, i.e. in the case of the decision situation above LEFT, CENTER, or RIGHT.

Your earnings for this task will be determined as follows. First, the computer will randomly select with 50-50 chance one of the two decision situations. Your earnings for this task will be determined based on the combination of your decision and OTHER's decision in that decision situation as follows. The combination of your decision and OTHER's decision determines a box in the table. If you are a Row participant and OTHER is a Column participant, your earnings are listed in the lower left corner of the box and OTHER's earnings are listed in the upper right corner. If you are a Column participant and OTHER is a Row participant, your earnings are listed in the upper right corner of the box and OTHER's earnings are listed in the lower left corner.

Note that only one of the two decision situations will be used for determining your earnings for this task. However, keep in mind that because you don't know which decision situation will be used, it is in your best interest to make your decision carefully in both decision situations.

Of course, as explained in the beginning of today's session, your earnings for this task will only be used for payment if this task is the one selected for payment.

# **Understanding Quiz**

Suppose you are a Row participant. In the decision situation above:

-	if you choose UP and OTHER chooses LEFT, you will earn \$OTHER will earn \$	and
-	if you choose UP and OTHER chooses CENTER, you will earn \$ OTHER will earn \$	and
-	if you choose UP and OTHER chooses RIGHT, you will earn \$ OTHER will earn \$	and
-	if you choose DOWN and OTHER chooses LEFT, you will earn \$OTHER will earn \$	_ and
-	if you choose DOWN and OTHER chooses CENTER, you will earn \$_ and OTHER will earn \$	
-	if you choose DOWN and OTHER chooses RIGHT, you will earn \$OTHER will earn \$	_ and

Are there any questions? If not, we can start the task. You have 2 ½ minutes for making your decision in each decision situation in this task.

Task 2

In this task, you will make ten decisions. Each decision is a paired choice between "Option A" and "Option B". All ten decisions are shown in the screenshot below.

Subject ID 1								Remaining time	85
For each of the ten decisions below, please choose Option A or Option B.									
	Option A Option B								
Decision 1:	\$16	123456789 10	\$20	0.0	\$1	123456789 10	\$38.5		
Decision 2:	\$16	12345678 910	\$20	0.0	\$1	12345678 910	\$38.5		
Decision 3:	\$16	1234567 8910	\$20	0.0	\$1	1234567 8910	\$38.5		
Decision 4:	\$16	123456 78910	\$20	00	\$1	123456 78910	\$38.5		
Decision 5:	\$16	12345 678910	\$20	0.0	\$1	12345 678910	\$38.5		
Decision 6:	<b>\$</b> 16	1234 5678910	\$20	0.0	\$1	1234 5678910	\$38.5		
Decision 7:	\$16	123 45678910	\$20	0.0	\$1	123 45678910	\$38.5		
Decision 8:	\$16	12 345678910	\$20	0.0	\$1	12 345678910	\$38.5		
Decision 9:	\$16	1 2345678910	\$20	0.0	\$1	1 2345678910	\$38.5		
Decision 10:	\$16	12345678910	\$20	0.0	\$1	12345678910	\$38.5		
								ок	

For example, let us focus on the first decision. Option A and Option B in this decision are to be understood as follows. Option A pays either \$16 or \$20; Option B pays either \$1 or \$38.5. The computer will randomly determine which amount each option pays. In particular, the computer will randomly select one of the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 where each number is equally likely to be selected. You can imagine that the computer selects a number by throwing a ten-sided die. If the number is to the left of the vertical line in the description of an option in the screenshot above, the option pays the smaller dollar amount; if the number is to the right of the vertical line, the option pays the larger dollar amount. That is, if the number is 1, 2, 3, 4, 5, 6, 7, 8, or 9, Option A pays \$16 and Option B pays \$1. On the other hand, if the number is 10, Option A pays \$20 and Option B pays \$38.5.

Now, consider all ten decisions. Notice that in each decision, Option A pays either \$16 or \$20 and Option B pays either \$1 or \$38.5. The only difference between decisions is that as you move down the rows, the chance that each option pays the high payoff increases. This is the case because the vertical line in each option shifts to the left as you move down the rows. In decision 10, the vertical line is all the way to the left which means that option A pays \$20 for sure and Option B pays \$38.5 for sure.

For each decision in this task, you have to choose either Option A or Option B. How you choose between Option A and Option B in each decision is entirely a question of personal preference—there is no right or wrong answer. The only restriction on your choices is the following.

Suppose that in some decision you choose Option B. Then, in all subsequent decisions you have to keep choosing Option B. The reason is that, in subsequent decisions, Option B becomes more attractive: the chance it pays \$38.5 increases and the chance it pays \$1 decreases.

### Earnings:

Your earnings for this task will be determined as follows. First, the computer will randomly select one of the ten decisions. (Each decision has an equal chance of being selected.) Then, the computer will roll a ten-sided die to pick a number 1 to 10. This number, in combination with your option choice for the selected decision, will determine your earnings.

Note that only one of the decisions will be used for determining your earnings for this task. However, keep in mind that because you don't know which decision will be used, it is in your best interest to make all ten decisions carefully.

Of course, as explained in the beginning of today's session, your earnings for this task will only be used for payment if this task is the one selected for payment.

# **Understanding Quiz**

Let's say decision 5 is the randomly selected decision.

decision 5?

1.	Assume you chose Option A in decision 5. If, when the computer "rolls the tersided die", the "die" comes up 2, your earnings for Task 1 will equal
2.	Assume you chose Option A in decision 5. If, when the computer "rolls the tersided die", the "die" comes up 7, your earnings for Task 1 will equal
3.	Assume you chose Option B in decision 5. If, when the computer "rolls the tensided die", the "die" comes up 2, your earnings for Task 1 will equal
4.	Assume you chose Option B in decision 5. If, when the computer "rolls the tensided die", the "die" comes up 7, your earnings for Task 1 will equal
5.	Is it possible that someone chooses Option A in decision 3 and Option A in decision 5?
6.	Is it possible that someone chooses Option A in decision 3 and Option B in decision 5?
7.	Is it possible that someone chooses Option B in decision 3 and Option A in decision 5?
8.	Is it possible that someone chooses Option B in decision 3 and Option B in

Are there any questions? If not, we can start the task. You have 3 minutes for making all ten decisions in this task.

#### Overview:

In this task, you will be randomly matched with another subject whom we refer to as OTHER. This matching will be anonymous—no one will ever find out who they were matched with.

You and OTHER will play a game. The game consists of two players; a "first mover" who moves first, and a "second mover" who follows. At the outset, the first mover receives \$16.00. The first mover then decides whether to keep this money, or to pass it along. If the money is passed it is multiplied by three and given to the second mover, who then must decide whether to split the total amount equally or keep it.

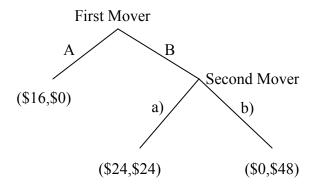
### Specific Instructions:

The first mover has to decide whether to:

- A. Keep \$16 and pass \$0 or
- B. Keep \$0 and pass \$16

If the first mover chooses A, i.e. keeps \$16 and passes \$0, the game ends. If the first mover chooses B, i.e. keeps \$0 and passes \$16, the \$16 passed by the first mover is tripled so that the second mover has to decide what to do with \$48. In particular, the second mover has two options:

- a) Keep \$24 and pass \$24 back to the first mover or
- b) Keep \$48 and pass \$0 back to the first mover



You have to make two decisions. In particular, you have to decide:

- 1. What you would choose if you are the first mover: A or B;
- 2. What you would choose if you are the second mover and OTHER passed \$16 to you so that you have \$48 available. For this case, you must choose either a) or b).

## Earnings:

Your earnings for this task will be determined as follows. The computer will determine with probability 50-50 whether you are the first mover or the second mover.

If you are the first mover, the computer will first check what you would do as the first mover. If you would keep \$16 and pass \$0, your earnings for this task will equal \$16 and OTHER's earnings will equal \$0. On the other hand, if you would keep \$0 and pass \$16, the computer checks OTHER's choice. If OTHER keeps \$48 and passes \$0 back, you will earn \$0 and OTHER will earn \$48. If OTHER keeps \$24 and passes \$24 back, you will earn \$24 and OTHER will earn \$24.

If you are the second mover and OTHER the first mover, things are analogous. Just switch the words you/your with OTHER/OTHER's in the previous paragraph. That is, the computer will first check whether OTHER kept \$16 or passed \$16 to you (so that you have \$48 available). In the latter case, the computer will also check whether you elected to keep \$24 and pass back \$24, or to keep the \$48.

Of course, as explained in the beginning of today's session, your earnings for this task will only be used for payment if this task is the one selected for payment.

Are there any questions? If not, we can start the task. You have 3 minutes for making both of your decisions in this task.

### Task 4

#### Overview:

This task, concerns a *Decision Tree*. This decision tree is simply a short sequence of decisions to be taken by you, interlaced with moves taken by the computer. Each sequence of decisions by you and moves by the computer leads to a payoff.

### The Decision Tree:

The *Decision Tree*, depicted below, is characterized by a sequence of *decision* and *chance* nodes. At each node, there are two subsequent paths to follow: Up and Down. At each *decision node* you will have to make a *decision* whether to go Up or Down. At each *chance node*, the computer will choose Up or Down randomly with 50-50 chance. Regardless of what happened previously in the decision tree, the computer always chooses Up or Down with equal probability. Thus, it is impossible to predict what the computer is going to do: Up and Down are equally likely.

A sequence of decision and chance nodes consists of a decision node, followed by a chance node, followed by a decision node, followed by a chance node. After the second and final chance node is played out you will arrive at a payoff node. Each *payoff node* has associated with it a monetary *payoff* which is written next to it.

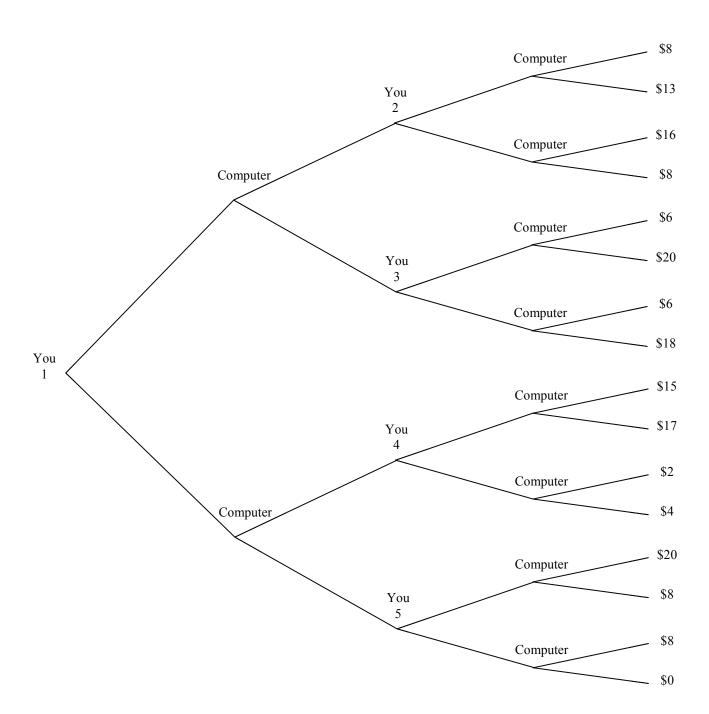
# How the task will proceed:

You should first study the decision tree carefully, and particularly the various possible payoff nodes. You will end up at one of these payoff nodes. After you have studied the tree you can enter your decision regarding whether you would like to move Up or Down at decision node 1 which is at the left end of the tree (see picture). Once you hit "OK", your decision will lead to a particular chance node at which the computer will move. The computer's move will then lead to your next decision node. You will be told whether the computer moved Up or Down and whether this led to decision node 2, 3, 4, or 5. Then, you will be asked to once again decide whether to move Up or Down. After your move, the computer moves again and this leads to one of the payoff nodes.

# Earnings:

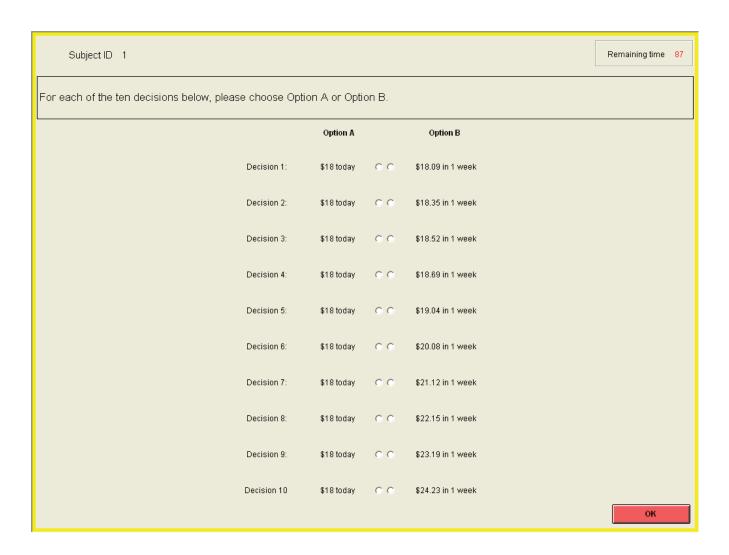
Your earnings in this task will equal the payoff at the payoff node that is reached. Of course, as explained in the beginning of today's session, your earnings for this task will only be used for payment if this task is the one selected for payment.

Are there any questions? If not, we can start the task. You have 5 minutes to make your first decision (the one at decision node 1) and 2 minutes to make your second decision (the one at one of the decision nodes 2, 3, 4, or 5).



Task 5

In this task, you will make ten decisions. Each decision is a paired choice between "Option A" and "Option B". All ten decisions are shown in the screenshot below.



For example, let us focus on the first decision. Option A and Option B in this decision are to be understood as follows. Option A pays \$18.00 today. Option B pays \$18.09 in one week.

Now, consider all ten decisions. Notice that in all decisions, Option A pays \$18 today and Option B pays an amount of money one week from today. The only difference between decisions is that as you move down, Option B pays progressively larger amounts.

For each decision in this task, you have to choose either Option A or Option B. How you choose between Option A and Option B in each decision is entirely a question of personal

preference—there is no right or wrong answer. The only restriction on your choices is the following.

Suppose that in some decision you choose Option B. Then, in all subsequent decisions you have to keep choosing Option B. The reason is that, in subsequent decisions, Option B becomes more attractive because it pays a larger amount.

### Earnings:

Your earnings for this task will be determined as follows. First, the computer will randomly select one of the ten decisions. Each decision has an equal chance of being selected. You will be paid for this task according to the option you chose in that decision.

In particular, if you chose Option A in the randomly selected decision, we will write you a check with today's date on it which you can cash immediately. If you chose Option B in the randomly selected decision, we will write you a check with a date on it which will be one week from today. You will not be able to cash this check before the date written on it, i.e. before one week from today.

Note that only one of the decisions will be used for determining your earnings for this task. However, keep in mind that because you don't know which decision will be used, it is in your best interest to make all ten decisions carefully.

Of course, as explained in the beginning of today's session, your earnings for this task will only be used for payment if this task is the one selected for payment.

# **Understanding Quiz**

Let's say decision 7 is randomly selected for payment.

1	Assume you chose	Option A in decision	7 Then v	ou will receive	a check for the
	amount	which is payable on	-	(date).	. 0110011 101 0110
2.		Option B in decision		· /	a check for the
	amount	which is payable on	-	(date).	
3.	Is it possible that so	omeone chooses Option		cision 4 and Or	otion A in

- decision 7?

  4. Is it possible that someone chooses Option A in decision 4 and Option B in
- 4. Is it possible that someone chooses Option A in decision 4 and Option B in decision 7?
- 5. Is it possible that someone chooses Option B in decision 4 and Option A in decision 7?
- 6. Is it possible that someone chooses Option B in decision 4 and Option B in decision 7?

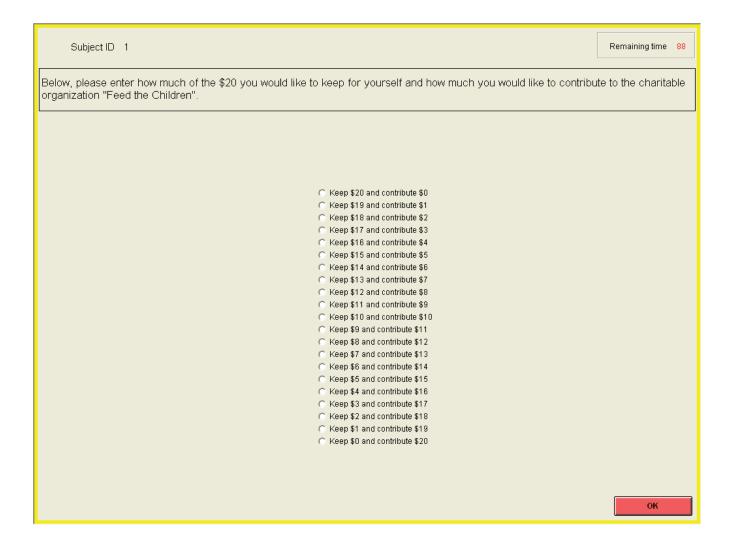
Are there any questions? If not, we can start the task. You have 2 minutes for making all ten decisions in this task.

#### Task 6

In this task, you are provided with \$20. You have to decide how much of these \$20 to keep for yourself and how much to contribute to the charitable organization "Feed the Children". You are free to contribute to the charitable organization any integer amount between \$0 and \$20, including \$0 and \$20.

Note: "Feed the Children" provides food, clothing, medical care, education, and emergency relief to children in the United States and overseas. We selected this charity because of the importance of the work it does, and because of the organization's efficiency (which is among the highest in the United Way).

You will make your decision by selecting one of the radio buttons shown on the screenshot below.



How much or little you decide to contribute is entirely a question of personal preference—there is no right or wrong answer.

Also note that your decision in this task will only be relevant if this task is the one selected for payment. If this is the case, your earnings for today's session will equal the amount you chose to keep for yourself plus the \$6 show-up fee. The amount you chose to contribute will go to the charity. We will add up the contributions all of you made and write a check for that amount for "Feed the Children". We will place the check in a stamped envelope and mail the check to "Feed the Children" immediately after the experiment. If this task is selected for payments, we encourage any of you who are interested to stay just a few minutes after the session to go with us to a mail box and post this check.

Are there any questions? If not, we can start the task. You have 2 minutes to make your decision in this task.



This working paper has been produced by the School of Economics and Finance at Queen Mary University of London

Copyright © 2014 Douglas Davis, Asen Ivanov and Oleg Korenok. All rights reserved

School of Economics and Finance Queen Mary University of London Mile End Road London E1 4NS

Tel: +44 (0)20 7882 7356 Fax: +44 (0)20 8983 3580

Web: www.econ.qmul.ac.uk/papers/wp.htm