Expectations of Reciprocity when Competitors Share Information: Experimental Evidence

Online Appendix and Supplementary Material

Bernhard Ganglmair* Alex Holcomb† Noah Myung‡

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Contents

*ZEW Mannheim, MaCCI, and University of Mannheim. Address: ZEW – Leibniz Centre for European Economic Research, L7, 1, 68161 Mannheim, Germany; E-mail: b.ganglmair@gmail.com; Twitter: @ganglmair.

†Appalachian State University, Department of Finance, Banking and Insurance, 416 Howard Street, Peacock Hall, Boone, NC 28608, USA; E-mail: holcombaj2@appstate.edu.

‡University of Virginia, Frank Batten School of Leadership and Public Policy, Charlottesville, VA 22904; E-mail: noah.myung@virginia.edu.

1 Construction of Expected Payoffs from Sharing

For the construction of the expected payoffs from sharing in equation (3), first note that in period t, player i holds $n_i = t$ ideas. We construct the payoffs by determining the probabilities that player i has exactly $n_i = t+q$ ideas for $q = 0, \ldots, \infty$. With $t+q$ ideas, player i's payoffs are $\mu\left(1 + \beta^{t+q}\right)$ in its own Segment i and $\mu \cdot \max\left\{\beta^{t+q-1} - \beta^{t+q}, 0\right\}$ in the competitive Segment C. We assume that once player i chooses to share in t, she shares in all future $t' > t$. Hence, $\sigma_i = 1$.

$t\quad$: When player i shares an idea in t, both players have t ideas and player i's payoffs are $\mu\left(1-\theta\right)\left(1 - \beta^t\right)$ with probability $1 - \pi_j = 1 - p_j\tilde{\sigma}_j$, that is, the probability that (i) player j fails to generate a new idea in $t+1$ (probability $1 - p_j$); or (ii) player j generates a new idea but conceals it in $t+1$ (probability $p_j\left(1 - \tilde{\sigma}_j\right)$).

$t+1$: Both players have $t+1$ ideas and player i's payoffs are $\mu\left(1-\theta\right)\left(1 - \beta^{t+1}\right)$ with probability $\pi_j\left(1 - p_i\right)$, that is, the probability that player j generates and shares a new idea in $t+1$ (probability π_j) but player i fails to generate a new idea in $t+2$ (probability $1 - p_i$).

$t+2$: Player i has $t+2$ ideas, player j has at least $t+2$ ideas, and player i's payoffs are $\mu\left(1-\theta\right)\left(1 - \beta^{t+2}\right)$ with probability $\pi_j p_i\left(1 - \pi_j\right)$, that is, the probability that (i) player j generates and shares a new idea in $t+1$ (probability π_j), player i generates and shares a new idea in $t+2$ (probability p_i), but player j fails to generate a new idea in $t+3$ (probability $1 - p_j$); or (ii) player j generates and shares a new idea in $t+1$ (probability π_j), player i generates and shares a new idea in $t+2$ (probability p_i), and player j generates a new idea but conceals it in $t+3$ (probability $p_j\left(1 - \tilde{\sigma}_j\right)$).

$t+3$: Both players have $t+3$ ideas and player i's payoffs are $\mu\left(1-\theta\right)\left(1 - \beta^{t+3}\right)$ with probability $\left(\pi_j\right)^2 p_i\left(1 - p_i\right)$, that is, the probability that (i) player j generates and shares a new idea in $t+1$ (probability π_j), player i generates and shares a new idea in $t+2$ (probability p_i), player j generates and shares a new idea in $t+3$ (probability π_j), but player i fails to generate a new idea in $t+4$ (probability $1 - p_i$).

$t+4$: Player i has $t+4$ ideas, player j has at least $t+4$ ideas, and player i's payoffs are $\mu\left(1-\theta\right)\left(1 - \beta^{t+4}\right)$ with probability $\left(\pi_j\right)^2 \left(p_i\right)^2 \left(1 - \pi_j\right)$, that is, the probability that (i) player j generates and shares a new idea in $t+1$ (probability π_j), player i generates and shares a new idea in $t+2$ (probability p_i), player j generates and shares a new idea in $t+3$ (probability π_j), player i generates and shares a new idea in $t+4$ (probability p_i), but player j fails to generate a new idea in $t+5$ (probability $1 - p_j$); or (ii) player j

generates and shares a new idea in $t+1$ (probability π_j), player i generates and shares a new idea in $t+2$ (probability p_i), player j generates and shares a new idea in $t+3$ (probability π_j), player i generates and shares a new idea in $t+4$ (probability p_i), player j generates a new idea but conceals it in $t+5$ (probability $p_j(1-\tilde{\sigma}_j)$).

$t=5$: Player i's payoffs are $\mu(1-\theta)(1-\beta^{t+5})$ with probability $(\pi_j)^3(p_i)^2(1-p_i)$.

$t=6$: Player i's payoffs are $\mu(1-\theta)(1-\beta^{t+6})$ with probability $(\pi_j)^3(p_i)^3(1-\pi_j)$.

$t=\ldots$: etc.

Continuing in this fashion and summing up player i's payoffs for each $q=0,\ldots,\infty$ weighted by the respective probability yields the expression for player i's expected payoffs from sharing in the main text.

2   Additional Tables and Figures

- In Figure B-1, we summarize the fraction of player A sharing her initial idea in Round 1, as well as player A's expectations $\tilde{\sigma}_B$ for three subsamples of matches: matches 1–3, matches 4–8, and matches 9 and higher.

- In Figure B-2, we depict the distributions for player A's expectations in Round 1 for our four treatments.

- In Table B-1, we provide the main results from Table 4 in the main text for three subsamples of matches: matches 1–3, matches 4–8, and matches 9 and higher.

- In Table B-2, we provide the results for the determinants of expectations $\tilde{\sigma}_j$ in Table 6 in the main text for two subsamples of matches: matches 1–6 and matches 7 and higher.

- In Table B-3, we provide the results on the effect of past experience on sharing from Table 7 in the main text for two subsamples of matches: matches 1–6 and matches 7 and higher.

Figure B-1: Sharing and Expectations in Round 1 by Match Groups

This figure plots the average level of sharing in Round 1 by player A, as well as player A's expectations $\tilde{\sigma}_B$ in Round 1 for all four treatments (High, Low, Low-High [L-H], and High-Low [H-L]). We provide the graphs for three subsamples of matches: 1–3 (early matches), 4–8 (intermediate matches), and 9 or higher (late matches).
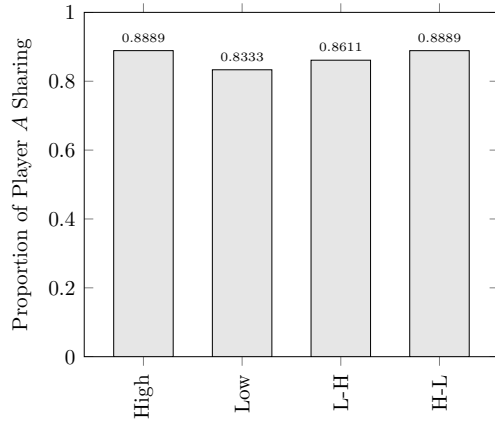
(a) Sharing (Round 1) in Matches 1–3
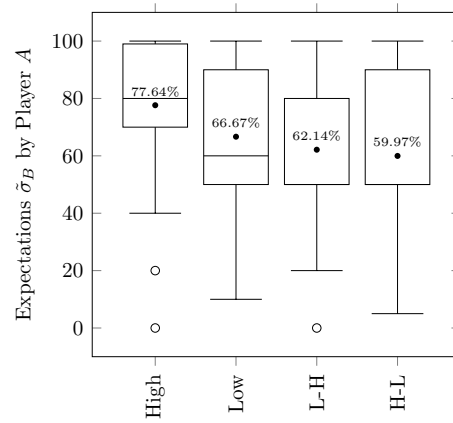
(b) Expectations in Matches 1–3
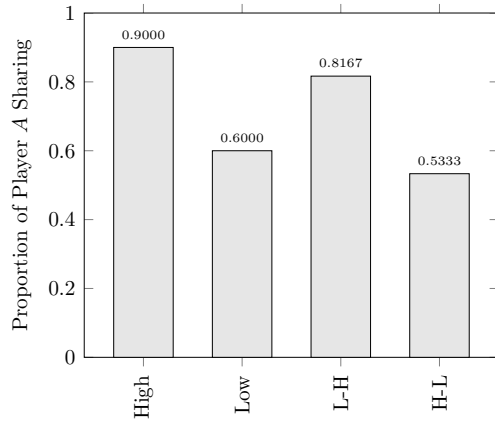
(c) Sharing (Round 1) in Matches 4–8
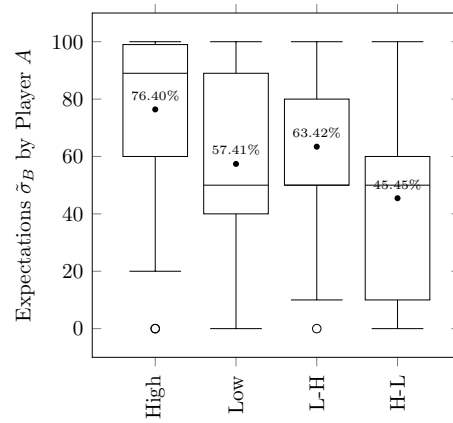
(d) Expectations in Matches 4–8
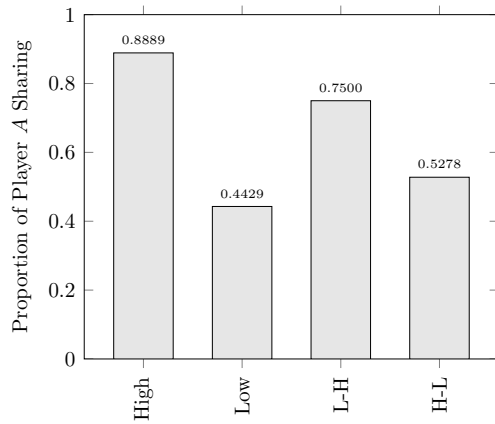
(e) Sharing (Round 1) in Matches ≥ 9
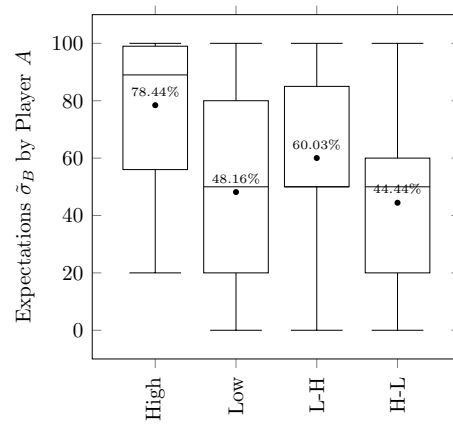
(f) Expectations in Matches ≥ 9

Figure B-2: Player *A*'s Expectations

This figure provides histograms (left scale; bars) and kernel density estimates (right scale; curve) of player *A*'s expectations in Round 1. The percentage numbers indicate the size of three subgroups of expectations: "low" expectations for $\tilde{\sigma}_B \in [0\%, 33\%]$, "medium" expectations for $\tilde{\sigma}_B \in (33\%, 66\%]$, and "high" expectations for $\tilde{\sigma}_B \in (66\%, 100\%]$.
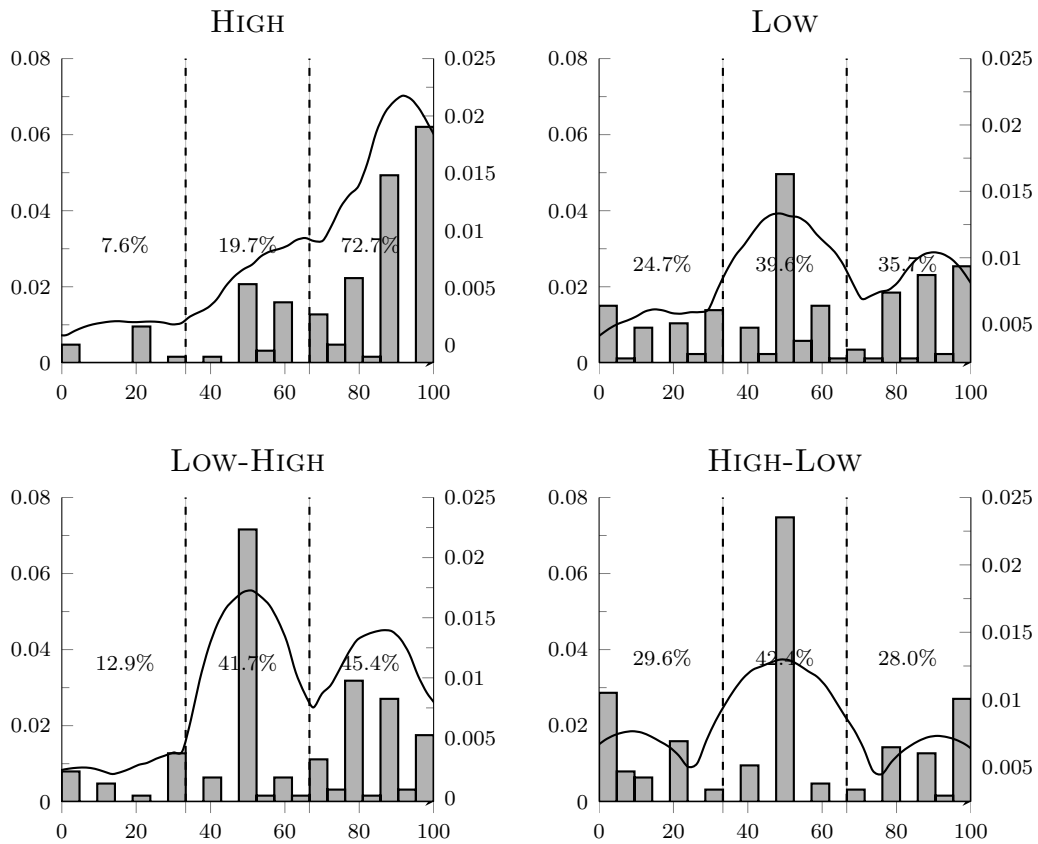
Player *A*'s Expectations in Round 1

Table B-1: Effects of Ability and Intentions by Match Groups

We report probit results for all four treatments for three subsamples of matches: 1–3 (early matches), 4–8 (intermediate matches), and 9 and higher (late matches). The dependent variable is a dummy variable = 1 if player A shares in Round 1, and = 0 otherwise. Player A's expectations of reciprocity are captured by *Cross success* (player B's cross-success probability p_B) and *Expected intentions* (player A's expectations $\tilde{\sigma}_B$ that player B will share in Round 2). *Own success* is player A's own-success probability p_A. The number of observations is the number of Round 1 decisions by player A. Reported marginal effects are average marginal effects. We report standard errors in parentheses.

	Dependent variable = 1 if player A shares in Round 1 and = 0 o.w.				
	(I)	(II)	(III)	(IV)	(V)
Matches 1–3					
Cross success	-0.0004	0.0004		0.0004	-0.0004
	(0.0013)	(0.0014)		(0.0014)	(0.0013)
Expected intentions	0.0048***		0.0048***		0.0048***
	(0.0009)		(0.0009)		(0.0009)
Own success				0.0011	0.0006
				(0.0014)	(0.0013)
Observations	150	150	150	150	150
Matches 4–8					
Cross success	0.0045***	0.0070***		0.0070***	0.0045***
	(0.0012)	(0.0012)		(0.0012)	(0.0012)
Expected intentions	0.0052***		0.0061***		0.0053***
	(0.0007)		(0.0006)		(0.0007)
Own success				0.0003	0.0008
				(0.0014)	(0.0013)
Observations	250	250	250	250	250
Matches 9 and higher					
Cross success	0.0048***	0.0084***		0.0080***	0.0047***
	(0.0016)	(0.0015)		(0.0015)	(0.0016)
Expected intentions	0.0058***		0.0069***		0.0057***
	(0.0008)		(0.0006)		(0.0008)
Own success				0.0028	0.0021
				(0.0017)	(0.0016)
Observations	178	178	178	178	178

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B-2: Determinants of Subjective Expectations by Match Groups

We report the results from tobit models for the determinants of a player i's expectations in t about player j's intentions to share in $t + 1$ in all treatments. The dependent variable is $\tilde{\sigma}_j \in [0, 100]$ in a given round t of a match. *Cross p_j* is player j's cross-success probability; *Own p_i* is player i's own-success probability; *Match* is the match number; *Round* is the round number, t, in a given match; *Other Terminated* is a dummy variable = 1 if player i has previously had a match partner (either as player i or player j) who terminated their match by choice (i.e., concealed an idea), and = 0 otherwise; *Own Terminated* is a dummy variable = 1 if player i has previously terminated a match by choice (i.e., concealed an idea) either as player i or as player j, and = 0 otherwise; *Other × Own Terminated* is an interaction term. Both *Other Terminated* and *Own Terminated* are, by definition, = 0 in the very first match. *Subject Dummies* indicates whether subject dummies are included to control for subject-fixed effects. The number of observations is the total number of decisions by player i in all t. The left-censoring limit for the tobit model is 0; the right-censoring limit is 100. We report standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	Dependent variable: Player i's subjective expectations $\tilde{\sigma}_j \in [0, 100]$ in a given round t of a match				
	(I) Tobit	(II) Tobit	(III) Tobit	(IV) Tobit	(V) Tobit
Matches 1–6					
Cross success	0.3091*** (0.0590)	0.3246*** (0.0570)	0.3216*** (0.0572)	-0.5072* (0.2651)	-0.5405** (0.2655)
Own success	0.0868 (0.0606)	0.1230** (0.0583)	0.1223** (0.0582)	-0.5266** (0.2616)	-0.5643** (0.2623)
Round	2.3456*** (0.3348)	2.1750*** (0.3217)	2.1651*** (0.3219)	0.4795* (0.2458)	0.4898** (0.2459)
Other Terminated		3.8012* (2.1541)	4.7342* (2.6840)	-6.8050*** (2.0556)	-9.1285*** (2.4978)
Own Terminated		-18.9768*** (2.2412)	-17.4933*** (3.3894)	-0.9366 (2.5527)	-4.3488 (3.2866)
Other × Own Terminated			-2.6384 (4.5282)		7.0477 (4.2856)
Observations	824	824	824	824	824
Matches 7 and higher					
Cross success	0.5696*** (0.0662)	0.5453*** (0.0661)	0.5453*** (0.0661)	0.1247 (0.3279)	0.1247 (0.3279)
Own success	0.3191*** (0.0676)	0.3079*** (0.0669)	0.3079*** (0.0669)	-0.1725 (0.3335)	-0.1725 (0.3335)
Round	0.7293** (0.3592)	0.6740* (0.3566)	0.6740* (0.3566)	0.3341 (0.2630)	0.3341 (0.2630)
Other Terminated		1.9123 (7.7722)	1.9123 (7.7722)	-3.2359 (10.5794)	-3.2359 (10.5794)
Own Terminated		-11.3394*** (2.6640)	-11.3394*** (2.6640)	-5.0646 (5.0524)	-5.0646 (5.0524)
Other × Own Terminated			0.0000 (.)		0.0000 (.)
Observations	750	750	750	750	750
Subject dummies	No	No	No	Yes	Yes

Table B-3: Effect of Past Experience on Sharing by Match Groups

We report the results from probit models for the effect of a player A's previous experience for two subsamples of matches: 1–6 (early matches) and 7 and higher (late matches). The dependent variable is a dummy variable = 1 if player A shares in Round 1, and = 0 otherwise. Player A's expectations of reciprocity are captured by *Cross* p_B (player B's cross-success probability) and *Expect*. $\bar{\sigma}_B$ (player A's expectations that player B will share in Round 2). *Own* p_A is player A's own-success probability. *Other Terminated* is a dummy variable = 1 if player A has previously had a match partner (either as player A or player B) who terminated their match by choice (i.e., concealed an idea), and = 0 otherwise; *Own Terminated* is a dummy variable = 1 if player A has previously terminated a match by choice (i.e., concealed an idea) either as player A or as player B, and = 0 otherwise. Both *Other Terminated* and *Own Terminated* are, by definition, = 0 in the very first match. *Subject Dummies* indicates whether subject dummies are included to control for subject-specific effects. The number of observations is the number of Round 1 decisions by player A. Reported marginal effects in column ME are average marginal effects; reported ME for dummy variables *Other Terminated* and *Own Terminated* are for a discrete change from 0 to 1. We report standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)
				Dependent variable = 1 if player A shares in Round 1 and = 0 otherwise					
Matches 1–6									
Cross success	0.0027**	0.0035***	0.0035***	-0.0008	0.0015	0.0009	-0.0055	-0.0014	-0.0034
	(0.0011)	(0.0010)	(0.0010)	(0.0021)	(0.0022)	(0.0022)	(0.0078)	(0.0087)	(0.0081)
Expected intentions	0.0055***	0.0041***	0.0041***	0.0046***	0.0051***	0.0044***	0.0039*	0.0062***	0.0040***
	(0.0007)	(0.0007)	(0.0007)	(0.0013)	(0.0013)	(0.0013)	(0.0016)	(0.0014)	(0.0016)
Own success	0.0008	0.0010	0.0009	-0.0016	-0.0007	-0.0012	-0.0007	0.0026	0.0005
	(0.0011)	(0.0010)	(0.0010)	(0.0021)	(0.0020)	(0.0020)	(0.0071)	(0.0080)	(0.0073)
Other Terminated	-0.0723*		-0.0089	-0.2436***		-0.1658**	-0.4686***		-0.3626***
	(0.0428)		(0.0415)	(0.0737)		(0.0798)	(0.1043)		(0.1268)
Own Terminated		-0.2340***	-0.2314***		-0.2702***	-0.2066***		-0.3416***	-0.1664
		(0.0354)	(0.0374)		(0.0725)	(0.0798)		(0.0907)	(0.1082)
Observations	300	300	300	124	124	124	124	124	124
Matches 7 and higher									
Cross success	0.0044***	0.0034***	0.0032***	-0.0015	0.0000	-0.0010	-0.0321	-0.0297	-0.0297
	(0.0012)	(0.0011)	(0.0011)	(0.0029)	(0.0026)	(0.0028)	(2.3191)	(1.8160)	(1.8160)
Expected intentions	0.0055***	0.0050***	0.0050***	0.0073***	0.0069***	0.0070***	0.0110***	0.0103***	0.0103***
	(0.0006)	(0.0006)	(0.0006)	(0.0009)	(0.0009)	(0.0009)	(0.0016)	(0.0017)	(0.0017)
Own success	0.0018	0.0022**	0.0022**	-0.0032	-0.0024	-0.0021	-0.0335	-0.0357	-0.0249
	(0.0012)	(0.0011)	(0.0011)	(0.0022)	(0.0022)	(0.0022)	(2.3191)	(1.8160)	(1.8161)
Other Terminated	-0.0460		-0.1188	-0.2577		-0.2765	-0.2051		-0.4333
	(0.2148)		(0.1822)	(0.2969)		(0.2824)	(0.4753)		(0.9362)
Own Terminated		-0.4854***	-0.4867***		-0.3490*	-0.3549**		-0.4832**	-0.4832**
		(0.0822)	(0.0819)		(0.1562)	(0.1560)		(0.2138)	(0.2138)
Observations	278	278	278	105	105	105	105	105	105

3 Additional Results: The Effect of Competition

The degree of competition between the players (captured by the relative weight of their own segment and the competitive Segment C) matters. The sharing condition in the main text,

$$\tilde{\phi}_i(\tilde{\sigma}_j) \equiv \mu\left[\frac{1 + \beta p_i}{1 + \beta\pi_j}\beta\pi_j - \theta\right] \geq 0, \tag{B-1}$$

is more restrictive with higher values of θ. We interpret this as player i is less willing, and thus less likely, to share an idea when the competition between the two players is fierce. With fierce competition the benefits of staying ahead of the other player are higher whereas the overall expected payoffs from sharing are lower. Thus, it should hold that player i's sharing condition (B-1) is less restrictive and player i is more willing and more likely to share a newly generated idea in t when the degree of competition θ is low.

We use two values for the competition parameter, that is, $\theta = 3/8$ reflecting relatively low competition and $\theta = 5/8$ reflecting relatively high competition. For the success probabilities p_A and p_B, we use 50% and 90%, and $p_A = p_B$ (symmetric probabilities). We summarize the calibrations in Table B-4.

Table B-4: Calibration and Treatments (Varying the Degree of Competition)

	$\theta = 3/8$	$\theta = 5/8$
$p_A = p_B = 90\%$	HIGH	HIGH'
$p_A = p_B = 50\%$	LOW	LOW'

In the alternative high-probability treatment HIGH′ with high competition, condition B-1 for a sharing equilibrium holds for both players; however, it is less pronounced than in HIGH. In the alternative low-probability treatment LOW′ with high competition, condition B-1 is violated because the theoretical value for the expected net payoffs from sharing is negative. For both levels of symmetric probabilities, the theoretical net benefits (for $\tilde{\sigma}_j = 1$) are lower with higher competition.

In Table B-5, we present results from means tests. We find a negative effect of higher competition on player A's decision to share in Round 1, as predicted by theory.

Table B-5: Effect of Competition on Player A's Decision to Share

We report the average level of sharing in Round 1 by player A and player A's (theoretical) expected net benefits from sharing, $\tilde{\phi}_A(1)$, as defined in equation (B-1). In the bottom portion of the table, we report the results of one-tailed unpaired two-sample t-tests of the pair-wise difference of the mean of sharing (in Round 1 by player A). The prediction is a positive average treatment effect on sharing for treatments with higher $\tilde{\phi}_A$ relative to lower $\tilde{\phi}_A$. We predict that Sharing (Rd 1): HIGH > Sharing (Rd 1): HIGH' and Sharing (Rd 1): LOW > Sharing (Rd 1): LOW'. We report the average treatment effects with standard errors in parentheses.

Treatment	$\tilde{\phi}_A(1)$	Sharing in Round 1 by player A	
		Mean (s.e.)	N
HIGH (with $\theta = 3/8$)	120	0.8939 (0.026)	132
LOW (with $\theta = 3/8$)	0	0.5934 (0.036)	182
HIGH' (with $\theta = 5/8$)	20	0.6616 (0.033)	198
LOW' (with $\theta = 5/8$)	-100	0.4166 (0.043)	132

Differences: Unpaired two-sample t-test

Prediction	Average treatment effect on sharing (s.e.)	

Effect of competition, θ (Prediction)

Prediction	Average treatment effect on sharing (s.e.)	
Sharing (Rd 1): HIGH > Sharing (Rd 1): HIGH'	0.2323***	(0.046)
Sharing (Rd 1): LOW > Sharing (Rd 1): LOW'	0.1767***	(0.056)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4 Material for Experiment

4.1 Instructions (for Treatment Low-High)

Experiment Overview

You are about to participate in an experiment on the economics of decision-making. If you listen carefully and make good decisions, you can earn a considerable amount of money. You will be paid in cash at the end of the experiment.

Please do not communicate with the other participants. If you have questions, please raise your hand. The experimenter will come to you to answer them.

It will take you about 90 minutes to complete this session. After the experiment, you will be given a short survey to complete.

You will be working with a fictitious currency called *Francs*.

Exchange rate: 100 *Francs* = 1 USD

Today's experiment consists of two tasks. In Task 1, you will be asked to choose from a pair of options. Each option involves two payments. Each payment has a specified probability (i.e., choose one of two lotteries). For Task 2, you and another player in this room will be matched to perform a computer experiment.

Detailed Instructions

Task 1: Choose a Lottery

Your decision sheet shows ten decisions listed on the right. Each decision is a paired choice between "Choice A" and "Choice B." You will make ten decisions and record these in the first column. You may choose A for some decision rows and B for other rows. You may change your decisions and make them in any order. Only one of these decisions will be used to determine your earnings upon completion of Task 2.

A ten-sided die is used to determine your earnings. The faces are numbered from 1 to 10 (the "0" face will serve as 10.) After you have made all of your Task 1 decisions and completed the computer experiment (Task 2) you will be asked to come to the front desk. The experimenter will throw the die twice: The first throw will determine which of your ten decisions is to be used. Given your choice for this decision (A or B), the second throw will determine your earnings (in Francs). The earnings for this choice will be added to your earnings from Task 2, and, when finished, you will be paid all earnings in cash.

Even though you will make ten decisions, only one of these will affect your earnings. You will not know in advance which decision will be used. Obviously, each decision has an equal chance of being used in the end.

Look at Decision 1 and Decision 2:

Your Choice	Choice A	Choice B
Write A or B	Die face 1 pays 200 (chance of 1/10) Die face 2-10 pays 160 (chance of 9/10)	Die face 1 pays 385 (chance of 1/10) Die face 2-10 pays 10 (chance of 9/10)
Write A or B	Die face 1-2 pays 200 (chance of 2/10) Die face 3-10 pays 160 (chance of 8/10)	Die face 1-2 pays 385 (chance of 2/10) Die face 3-10 pays 10 (chance of 8/10)

For Decision 1, Choice A pays 200 Francs if the throw of the ten-sided die is 1 (i.e., with a chance of 1/10), and it pays 160 Francs if the throw is 2 through 10 (i.e., with a chance of 9/10). Choice B yields 385 Francs if the throw of the die is 1 (chance of 1/10), and it pays 10 Francs if the throw is 2 through 10 (chance of 9/10).

For Decision 2, Choice A pays 200 Francs if the throw of the ten-sided die is either 1 or 2 (i.e., with a chance of 2/10), and it pays 160 Francs if the throw is 3 through 10 (i.e., with a chance of 8/10). Choice B yields 385 Francs if the throw of the die is either 1 or 2 (chance of 2/10), and it pays 10 Francs if the throw is 3 through 10 (chance of 8/10).

Decisions 3 through 10 are similar except that as you move further down the table, the chance of the higher payoff for each choice increases. Since either option in Decision 10 pays the highest with certainty (200 or 385 Francs), the die will not be needed.

<center>Are there any questions?</center>

You may now begin making your choices. Look at the empty boxes on the left side of the record sheet. For each decision row, decide between Choice A and B and write your decisions in these boxes until all ten decisions are complete.

Please do not talk with anyone during the experiment. If you have any questions, raise your hand. After you have completed this task, please stay in your seat. Once all participants have finished, the computer experiment (Task 2) will begin.

Task 2: Computer Experiment

Below is an explanation about the decisions you will be making in the computer experiment, the players you will be playing against, and the information you will receive and have available during this experiment.

Players: You are a fund manager. Your goal is to earn as much money as possible. Your earnings can increase in two ways: a) increase the returns from your investments and b) obtain more investors.

24 people in this room are participating in this experiment. That splits into two groups of 12 each. To begin the game, you will be randomly matched with another player from your group. Then there will be a series of matches. For the first match, you and this player will be randomly assigned roles (either Fund Manager A or Fund Manager B). There

<center>B-12</center>

will be several matches, all with different players from your group. You will be matched with the same person only once. During each match, you will play the game for an undetermined number of rounds. From one match to another, your assignment as either Fund Manager A or Fund Manager B is determined randomly. You may be assigned as Fund Manager A for some matches and as Fund Manager B for other matches. This is determined randomly. This means that you will not be matched with a person with whom you have previously been matched, regardless of whether you were Fund Manager A or Fund Manager B.

Your identity is kept anonymous for the entire experiment. You are only displayed as "Fund Manager A" or "Fund Manager B."

Your decision affects only you and the person with whom you are matched. Your decision does not affect the other people participating in this experiment.

Setup: The investors you are trying to attract are divided into three segments.

Fund Manager A has completely captured the investors in Segment A. These investors have already invested with Fund Manager A and are currently in a lock-up period. This means, these investors have agreed not to move their investments for a period of several years. Therefore, they are locked-up with Fund Manager A. As Fund Manager A, you charge each Segment A investor a fee. As you generate greater returns for investors in Segment A, the fee increases. Therefore, even though these investors are locked-up, Fund Manager A is better off by generating higher returns for these investors.

For the same reason, Fund Manager B has completely captured the investors in Segment B. As Fund Manager B, you charge a fee to the investors in Segment B. Even though the Segment B investors are locked-up, the Fund Manager B receives higher fees by generating higher returns for these investors.

Segment C consists of new investors. They are not locked-up by either of the managers. Therefore, Fund Manager A and Fund Manager B must compete for the investors in Segment C. Investors in Segment C will invest with the fund manager who provides the highest expected returns.

Note that none of the participants in this experiment are assigned the role of "investor." Decisions made by investors are done automatically. This means that investors will automatically choose the fund manager who offers the highest expected return.

Many of the computations are done for you and the payments will be clearly shown to you in a table format. You do not have to figure out the fees you want to charge nor the expected return of the investment. The computer will automatically compute these for you and show you your actual earnings. The only decision you, as the fund manager, will have to make is explained below.

Decision: Fund managers increase their returns as they gain more knowledge or information about potential investments. This information is referred to as "ideas." Having more ideas will give you an advantage over the other fund manager and you will be able to generate higher returns. Furthermore, if you have more ideas than the other fund manager, you will capture all the investors in Segment C. Conversely, if you have fewer ideas than the other fund manager, you will not capture any of the investors in Segment C. Essentially, the manager with the most ideas will capture all the investors in Segment C. Finally, if you and the other fund manager have the same number of ideas, then you will split the investors in Segment C evenly, but you will both have zero earnings from this segment.

Note that because Segments A and B's investments are locked-up, the competition between Fund Manager A and Fund Manager B does not affect those investments; however, having more ideas will increase the earnings the fund manager receives from Segment A or Segment B.

Your decision, as the fund manager, is to decide whether or not to share your ideas with the competing fund manager.

Fund Manager A initially starts out with one idea. Fund Manager B starts out with no ideas. Look at the diagram on the following page.

- In round 1, Fund Manager A must decide whether or not to share his one idea with Fund Manager B (starts with no ideas). If Fund Manager A chooses not to share, the match terminates and the earnings are realized. In that case, Fund Manager A has one idea and Fund Manager B has no ideas. If Fund Manager A chooses to share, then the experiment moves on to round 2.

- At the beginning of round 2, both fund managers start with one idea. Here, there is a 90% chance that Fund Manager B will generate a new idea and a 10% chance that Fund Manager B will not be able to generate a new idea (denoted as ï¿½chanceï¿½ in the following diagram). If Fund Manager B does not generate a new idea, then the match terminates with each manager having one idea and the earnings are realized. If Fund Manager B generates a new idea, then Fund Manager B has a total of two ideas while Fund Manager A has only one idea. At this time, Fund Manager B must decide whether or not to share this new idea with Fund Manager A. If Fund Manager B does not share, then the match terminates and the earnings are realized. If Fund Manager B chooses to share, then the experiment moves on to round 3.

- Similar to the previous round, at the beginning of round 3 both fund managers begin with two ideas. This time, there is a 50% chance that Fund Manager A generates a new idea and a 50% chance that Fund Manager A will not be able to generate a new idea. If Fund Manager A does not generate a new idea, then the match terminates with each manager having two ideas and the earnings are realized. If Fund Manager A generates a new idea, then Fund Manager A has a total of three ideas while Fund Manager B has only two ideas. At this time, Fund Manager A must decide whether or not to share this new idea with Fund Manager B. If Fund Manager A does not share, then the match terminates and the earnings are realized. If Fund Manager A chooses to share, then the experiment moves on to round 4.

- This process will continue until the match is terminated. Termination occurs either by one of the managers not sharing a new idea or when a new idea fails to be generated. As you may have noticed, the decisions are made in alternating sequence between Fund Manager A and Fund Manager B. Furthermore, the only way for a fund manager to generate a new idea is to have one shared with he or she by the other manager in the previous round.

- Finally, note that the chance of the Fund Manager A generating a new idea is always 50% while the chance of the Fund Manager B generating a new idea is always 90%.

Termination of a match: There are two ways your current match can terminate:
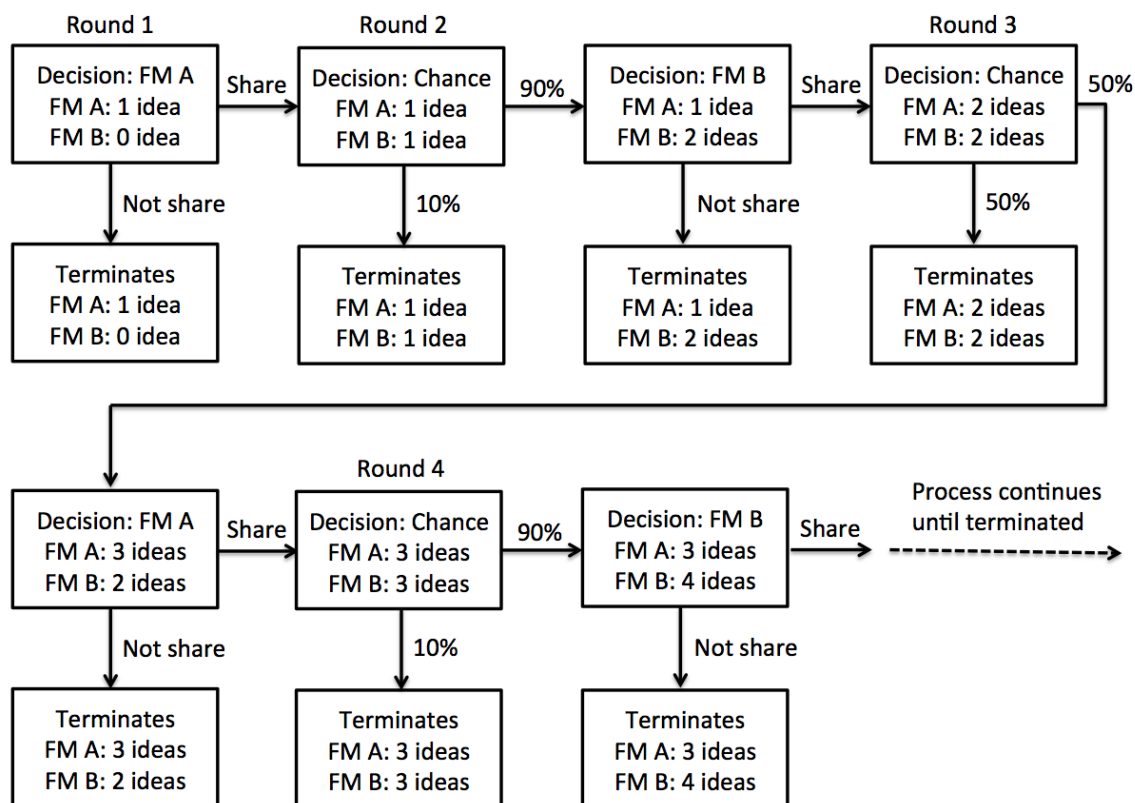
- Chance: At the beginning of each round (after the first round), there is a chance that the match terminates. This is because the fund manager (whose turn it is in this round) is not able to generate a new idea. This chance of successfully or unsuccessfully generating an idea is different between the Fund Manager A and the Fund Manager B. For Fund Manager A, there is a 50% chance of generating a new idea and 50% chance of failing to generate a new idea. This means that there is a 50% chance that the match terminates when it is Fund Manager A's round. For Fund Manager B, there is a 90% chance of generating a new idea and 10% chance of failing to generate a new idea. This means that there is a 10% chance that the match terminates when it is Fund Manager B's round.

  Think of a 10% chance as in the following analogy: There are 10 balls in a jar: 9 blue balls and 1 red ball. One ball is drawn from the jar and, if it is a red ball, the match terminates. The match continues if any one of the blue balls is drawn. In the actual experiment, the experiment's program is used to mimic this process.

  Similarly, think of 50% chance as in the following analogy: There are 2 balls in a jar: 1 blue ball and 1 red ball. One ball is drawn from the jar and, if it is a red ball, the match terminates. The match continues if the blue ball is drawn. In the actual experiment, the experiment's program is used to mimic this process.

- A fund manager decides not to share an idea: The current match terminates if the fund manager decides not to share a newly generated idea.

  The figure below summarizes the above statements:

Round 1

| Decision: FM A
FM A: 1 idea
FM B: 0 idea | →Share→ |
| Not share ↓ |

Terminates
FM A: 1 idea
FM B: 0 idea

Round 2

Decision: Chance
FM A: 1 idea
FM B: 1 idea →90%→

10% ↓

Terminates
FM A: 1 idea
FM B: 1 idea

Round 3

Decision: FM B
FM A: 1 idea
FM B: 2 ideas →Share→

Not share ↓

Terminates
FM A: 1 idea
FM B: 2 ideas

Decision: Chance
FM A: 2 ideas
FM B: 2 ideas →50%

50% ↓

Terminates
FM A: 2 ideas
FM B: 2 ideas

Round 4

Decision: FM A
FM A: 3 ideas
FM B: 2 ideas →Share→

Not share ↓

Terminates
FM A: 3 ideas
FM B: 2 ideas

Decision: Chance
FM A: 3 ideas
FM B: 3 ideas →90%→

10% ↓

Terminates
FM A: 3 ideas
FM B: 3 ideas

Decision: FM B
FM A: 3 ideas
FM B: 4 ideas →Share→

Not share ↓

Terminates
FM A: 3 ideas
FM B: 4 ideas

Process continues until terminated ------------------->

**Note:** "Chance" makes the move before the fund manager is able to decide to share or terminate.

Note: The specific round of termination of a match is not set by the experimenter. The match continues (potentially indefinitely) as long as neither the fund managers nor "chance" terminates.

Note: While the other fund manager makes his or her decision you will see a screen asking you to wait until it is again your turn. Please always click the "Continue" button when you see it on the screen for the experiment to continue.

Information: You and the person with whom you are matched will both know whether the termination is due to "chance" or because the other fund manager decided not to share a newly generated idea. When you and the other fund manager have the same realized earnings, then the match is terminated by "chance." If it is not terminated by "chance," then the match is terminated by the other fund manager.

New Match: When the current match terminates, please wait until everyone else's match terminates as well. When all matches are terminated, you will be randomly matched with a new player from your group and begin again. This procedure will be repeated until you have been matched exactly once with all other players in your group.

Earnings: Earnings for each match are determined in the following manner. First, the figure below shows you the total earnings for each fund manager, conditional on how the match was terminated.
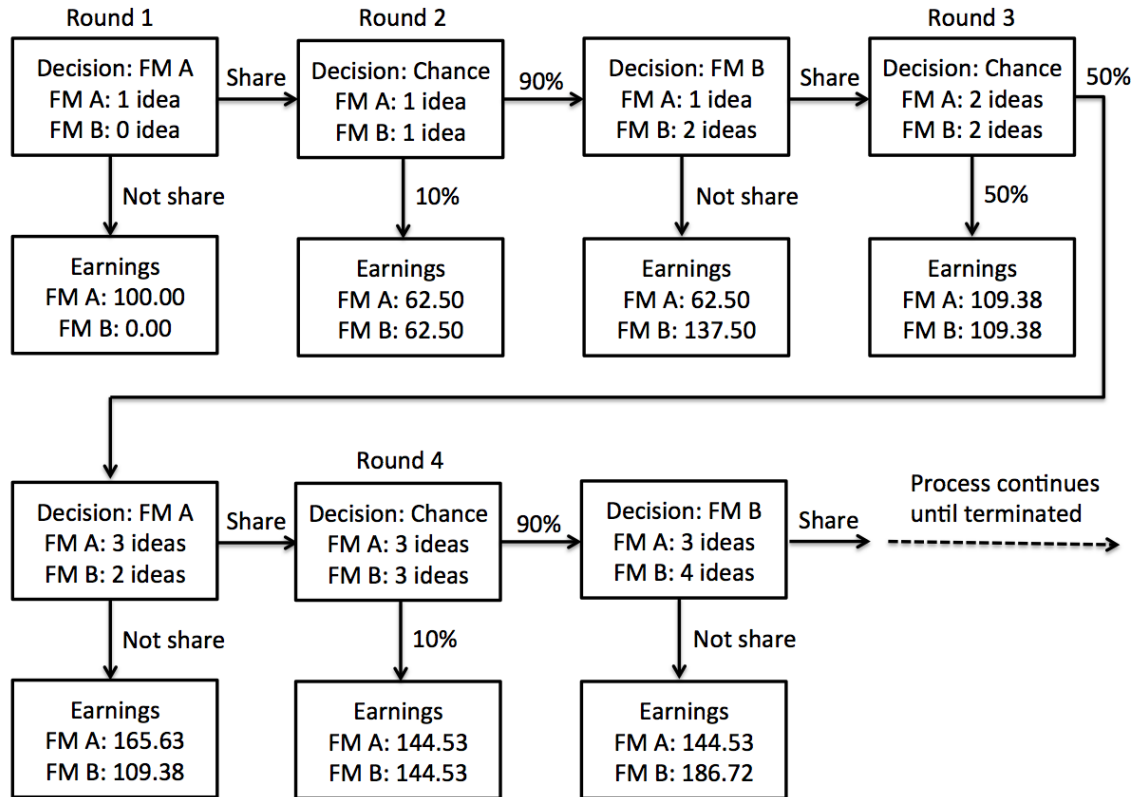
For a better understanding of earnings when the match is terminated, the following table shows each fund manager's earnings from Segment A, Segment B and Segment C. This is the information you will be provided on your computer screen.

Note: Due to rounding errors (a possible difference of 0.01), the sum of segment earnings (Segment A and Segment C for Fund Manager A and Segment B and Segment C for Fund Manager B) may not be exactly the same as the Total Earnings. Your definitive earnings is your Total Earnings.

Round	Terminated by	Earnings Fund Manager A		Earnings Fund Manager B	
1	Fund Manager A	Segment A:	62.50	Segment B:	0.00
		Segment C:	37.50	Segment C:	0.00
		Total:	100.00	Total:	0.00
2	Chance	Segment A:	62.50	Segment B:	62.50
		Segment C:	0.00	Segment C:	0.00
		Total:	62.50	Total:	62.50
	Fund Manager B	Segment A:	62.50	Segment B:	109.38
		Segment C:	0.00	Segment C:	28.13
		Total:	62.50	Total:	137.50
3	Chance	Segment A:	109.38	Segment B:	109.38
		Segment C:	0.00	Segment C:	0.00
		Total:	109.38	Total:	109.38
	Fund Manager A	Segment A:	144.53	Segment B:	109.38
		Segment C:	21.09	Segment C:	0.00
		Total:	165.63	Total:	109.38
4	Chance	Segment A:	144.53	Segment B:	144.53
		Segment C:	0.00	Segment C:	0.00
		Total:	144.53	Total:	144.53
	Fund Manager B	Segment A:	144.53	Segment B:	170.90
		Segment C:	0.00	Segment C:	15.82
		Total:	144.53	Total:	186.72
5	Chance	Segment A:	170.90	Segment B:	170.90
		Segment C:	0.00	Segment C:	0.00
		Total:	170.90	Total:	170.90
	Fund Manager A	Segment A:	190.67	Segment B:	170.90
		Segment C:	11.87	Segment C:	0.00
		Total:	202.54	Total:	170.90
6	Chance	Segment A:	190.67	Segment B:	190.67
		Segment C:	0.00	Segment C:	0.00
		Total:	190.67	Total:	190.67
	Fund Manager B	Segment A:	190.67	Segment B:	205.51
		Segment C:	0.00	Segment C:	8.90
		Total:	190.67	Total:	214.40
7	Chance	Segment A:	205.51	Segment B:	205.51
		Segment C:	0.00	Segment C:	0.00
		Total:	205.51	Total:	205.51
	Fund Manager A	Segment A:	216.63	Segment B:	205.51
		Segment C:	6.67	Segment C:	0.00
		Total:	223.30	Total:	205.51

Round	Terminated by	Earnings Fund Manager A		Earnings Fund Manager B	
8	Chance	Segment A:	216.63	Segment B:	216.63
		Segment C:	0.00	Segment C:	0.00
		Total:	216.63	Total:	216.63
	Fund Manager B	Segment A:	216.63	Segment B:	224.97
		Segment C:	0.00	Segment C:	5.01
		Total:	216.63	Total:	229.98
9	Chance	Segment A:	224.97	Segment B:	224.97
		Segment C:	0.00	Segment C:	0.00
		Total:	224.97	Total:	224.97
	Fund Manager A	Segment A:	231.23	Segment B:	224.97
		Segment C:	3.75	Segment C:	0.00
		Total:	234.98	Total:	224.97
10	Chance	Segment A:	231.23	Segment B:	231.23
		Segment C:	0.00	Segment C:	0.00
		Total:	231.23	Total:	231.23
	Fund Manager B	Segment A:	231.23	Segment B:	235.92
		Segment C:	0.00	Segment C:	2.82
		Total:	231.23	Total:	238.74
11	Chance	Segment A:	235.92	Segment B:	235.92
		Segment C:	0.00	Segment C:	0.00
		Total:	235.92	Total:	235.92
	Fund Manager A	Segment A:	239.44	Segment B:	235.92
		Segment C:	2.11	Segment C:	0.00
		Total:	241.55	Total:	235.92
12	Chance	Segment A:	239.44	Segment B:	239.44
		Segment C:	0.00	Segment C:	0.00
		Total:	239.44	Total:	239.44
	Fund Manager B	Segment A:	239.44	Segment B:	242.08
		Segment C:	0.00	Segment C:	1.58
		Total:	239.44	Total:	243.66
13	Chance	Segment A:	242.08	Segment B:	242.08
		Segment C:	0.00	Segment C:	0.00
		Total:	242.08	Total:	242.08
	Fund Manager A	Segment A:	244.06	Segment B:	242.08
		Segment C:	1.19	Segment C:	0.00
		Total:	245.25	Total:	242.08
14	Chance	Segment A:	244.06	Segment B:	244.06
		Segment C:	0.00	Segment C:	0.00
		Total:	244.06	Total:	244.06
	Fund Manager B	Segment A:	244.06	Segment B:	245.55
		Segment C:	0.00	Segment C:	0.89
		Total:	244.06	Total:	246.44

Although the table shows the first 14 rounds, the game continues (potentially <u>indefinitely</u>) until the match terminates. For every round during the experiment, you will be provided on your computer screen with the current round's earnings and the next round's potential earnings for both Fund Manager A and Fund Manager B. You may reference the above chart as well.

Note: While each additional idea increases your earnings, the next additional idea adds less of an improvement than the previous idea. This means that the first idea results in the greatest earnings increase; then the second idea results in a slightly smaller earnings increase; then the third idea results in less, and so on.

In Summary, your earnings as a fund manager are determined in two parts:

The **first part** of your earnings is determined by how many ideas you have. <u>The more ideas you collect, the greater the return (and earnings) will be for this part.</u> In order to collect more ideas, you and the other fund manager must generate and share your respective ideas with each other. In this way, having more ideas always increases Fund Manager A earnings from Segment A or for Fund Manager B from Segment B.

The **second part** of your earnings is determined by whether you have more ideas than the fund manager you are currently matched with. <u>Finishing the game with more ideas than the other fund manager means that you will capture all the investors in Segment C. Thus, you will capture all the earnings from Segment C as well.</u> Conversely, finishing the game with the same number of ideas as the other fund manager, or less ideas, will result in you having no earnings from Segment C.

Expectations: During the round in which you are deciding whether or not to share a newly generated idea, you will be asked the following question:

If, in the next round, the other fund manager successfully generates a new idea (i.e., "chance" does not terminate the match), how likely do you think the other fund manager will share this newly generated idea with you?

In the field provided, fill in these expectations. Enter a number between 0% and 100% (You do not have to add the %-sign).

Note: The probability that the other fund manager generates a new idea in the next round is 50% for Fund Manager A and 90% for the Fund Manager B. You are asked to enter your expectations of the other fund manager sharing this idea given that it has been generated.

Quiz

Note: The quiz does not affect your earnings.

1. Assume that you are Fund Manager A. During Round 6, do you make a decision?

2. Assume that you are Fund Manager B. During Round 3, Fund Manager A decided not to share the new idea with you. What are your earnings?

3. Assume that you are Fund Manager B. During Round 5, Fund Manager A has decided to share his or her idea with you. At the beginning of Round 6, however, you fail to generate a new idea ("chance" terminates the match). What are your earnings? What are Fund Manager A's earnings?

4. In question 3, do you, as Fund Manager B, get to make a decision after "chance" terminates the match in Round 5 (i.e., when Fund Manager A fails to generate a new idea)?

5. Assume that you are Fund Manager B. During Round 5, Fund Manager A has decided to share the new idea with you. At the beginning of Round 6, "chance" does not terminate your match (i.e., you generate a new idea). What are your earnings if you do not share the new idea? What are Fund Manager A's earnings?

6. In question 5, if you, as Fund Manager B, decide to share the new idea, then "chance" will determine whether the game terminates or not. If "chance" does not terminate (i.e., Fund Manager A generates a new idea), does Fund Manager A get to make his or her decision on whether to share the new idea with you?

7. Assume that you are Fund Manager B. In any round when it is your turn to make a decision, "chance" will first determine whether the game terminates or not. What is the probability that you fail to generate a new idea (the game terminates) and prevents you from making your decision?

8. Assume that you are Fund Manager A. After the first round, in any round when it is your turn to make a decision, "chance" will first determine whether the game terminates or not. What is the probability that you successfully generate a new idea (game does not terminate) and allows you the make your decision?

Procedural Summary

Here is what will happen after the instructions:

1. The first match will begin and you will be told what role you are assigned (Fund Manager A or Fund Manager B).

2. When it is your turn to make a decision (i.e., you have generated a new idea), you will be shown the earnings for this and the next several rounds; asked whether you wish to share your idea or not; and also asked to estimate the probability that the matched fund manager will choose to share his or her idea in next round. This continues until the match is terminated, but there is no predetermined end point for any given match: the match can be terminated only by "chance" (i.e., a fund manager fails to generate a new idea) or by the fund manager (he or she decides not to share). You will then be shown your earnings and the other fund manager's earnings. Because there are other matches simultaneously participating in this experiment, you must wait until everyone else's matches are also terminated.

3. When all matches are terminated, you will be randomly matched with another person and randomly assigned a new role (A or B). Then you and the new match will play the game again.

4. This continues until there are no more possible matches with the people in your group. You will know that the experiment has ended when you see a final survey showing up on your screen.

5. The experimenter will then ask you individually to come to the front. You will be paid in cash. Your total cash will be based upon the outcome of your decision in Task 1; and how much you earned in your matches combined during today's computer experiment (Task 2). In other words, you will be paid the total of Task 1 and Task 2 earnings.

4.2 Record Sheet for Holt-Laury Task

Task 1: Choose a Lottery

Please write your choices in the box provided on the left. Select either **Choice A** or **Choice B**, and write **"A"** or **"B"** to indicate your selection.

Your Choice:	Choice A	Choice B
	Die face 1 pays 200 (chance of $1/10$) Die face 2-10 pays 160 (chance of $9/10$)	Die face 1 pays 385 (chance of $1/10$) Die face 2-10 pays 10 (chance of $9/10$)
	Die face 1-2 pays 200 (chance of $2/10$) Die face 3-10 pays 160 (chance of $8/10$)	Die face 1-2 pays 385 (chance of $2/10$) Die face 3-10 pays 10 (chance of $8/10$)
	Die face 1-3 pays 200 (chance of $3/10$) Die face 4-10 pays 160 (chance of $7/10$)	Die face 1-3 pays 385 (chance of $3/10$) Die face 4-10 pays 10 (chance of $7/10$)
	Die face 1-4 pays 200 (chance of $4/10$) Die face 5-10 pays 160 (chance of $6/10$)	Die face 1-4 pays 385 (chance of $4/10$) Die face 5-10 pays 10 (chance of $6/10$)
	Die face 1-5 pays 200 (chance of $5/10$) Die face 6-10 pays 160 (chance of $5/10$)	Die face 1-5 pays 385 (chance of $5/10$) Die face 6-10 pays 10 (chance of $5/10$)
	Die face 1-6 pays 200 (chance of $6/10$) Die face 7-10 pays 160 (chance of $4/10$)	Die face 1-6 pays 385 (chance of $6/10$) Die face 7-10 pays 10 (chance of $4/10$)
	Die face 1-7 pays 200 (chance of $7/10$) Die face 8-10 pays 160 (chance of $3/10$)	Die face 1-7 pays 385 (chance of $7/10$) Die face 8-10 pays 10 (chance of $3/10$)
	Die face 1-8 pays 200 (chance of $8/10$) Die face 9-10 pays 160 (chance of $2/10$)	Die face 1-8 pays 385 (chance of $8/10$) Die face 9-10 pays 10 (chance of $2/10$)
	Die face 1-9 pays 200 (chance of $9/10$) Die face 10 pays 160 (chance of $1/10$)	Die face 1-9 pays 385 (chance of $9/10$) Die face 10 pays 10 (chance of $1/10$)
	Die face 1-10 pays 200 (chance of 1) No die face pays 160 (chance of 0)	Die face 1-10 pays 385 (chance of 1) No die face pays 10 (chance of 0)