Dynamic investment in teamwork skill: Theory and experimental evidence *

David Gill †

Victoria Prowse ‡

J. Lucas Reddinger §

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Abstract

Teamwork and collaboration are increasingly important. To help understand the dynamics of teamwork skill formation, we provide the first systematic analysis of dynamic investment in teamwork skill. First, adopting a dynamic game approach, we construct a theoretical framework where investment in team skill creates persistent benefits and externalities for teammates, but where investment is risky because the benefits depend on successful team coordination. Second, we take this framework to the laboratory to gain insight into factors that influence dynamic investment in team skill. We find under-investment compared to the efficient benchmark. However, investment in team skill responds strongly to incentives, in line with specific patterns predicted by our theory. We also find that people's theory of mind and propensity to coordinate predict how much they invest in team skill. We conclude that careful design of team incentives and selection of team members can facilitate the dynamic development of teamwork skills.

Keywords: *Teamwork, investment, skill, coordination, theory of mind, dynamic game, repeated game, basin of attraction, subgame-perfect Nash equilibrium, Stag Hunt game, experiment, machine learning.*

JEL Classification: *C73, C92, D91, J24.*

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†Purdue University, Department of Economics; dgill.econ@gmail.com

‡Purdue University, Department of Economics; vprowse@purdue.com

§Purdue University, Department of Economics; jlr@lucasreddinger.com

I Introduction

Teamwork and collaboration play an increasingly central role in the modern economy. Group work is essential in most contemporary occupations, teamwork skills are among the most sought-after attributes in new hires, and jobs requiring social interaction have become more prevalent and experienced faster wage growth (see Weidmann and Deming, 2021). Teams are increasingly dominant in the production of knowledge (Wuchty et al., 2007), teamwork intensity helps to predict future firm performance (Basu et al., 2024), and growing skill specificity since the 1980s has promoted sorting of talent into 'superstar teams' (Freund, 2025). Recent evidence from the field further corroborates the importance of teamwork skills (e.g., Arcidiacono et al., 2017, Bonhomme, 2021, Devereux, 2021; see also the summary by Deming, 2022). Furthermore, an extensive literature uses laboratory experiments to examine the factors that influence team performance, including incentives (e.g., Nalbantian and Schotter, 1997) and team size (e.g., Sutter, 2005).[1]

In this paper we aim to discover what drives investment in teamwork skill. Despite the increasing importance of teamwork, the dynamics of teamwork skill formation are not well understood. To the best of our knowledge, our paper provides the first systematic analysis of dynamic investment in teamwork skill. We make two main contributions. First, to capture dynamic investment in team skill we construct and analyze a theoretical framework with three key features: (i) investment in team skill is risky because the benefit depends on successful team coordination; (ii) investment in team skill creates potential positive externalities for teammates; and (iii) the game is dynamic because investment creates a permanent increase in team skill that persists until the end of the team relationship. Second, we take this framework to the laboratory to study the factors that influence dynamic investment in team skill, including incentives and individuals' traits such as their theory of mind ability and propensity to coordinate.

In Section II.A we construct our theoretical framework. In our *dynamic investment game*, two players interact repeatedly for a finite number of rounds (a "match", or supergame in formal terms). In the first part of every round, the players simultaneously choose whether or not to invest in team skill. Each investment increases team skill for the

[1]Other factors studied in experiments include trust (e.g., Schotter, 1998), communication (e.g., Sutter and Strassmair, 2009), punishment (e.g., Carpenter et al., 2009), and role assigment (e.g., Cooper and Sutter, 2018). In addition, several experiments compare team and individual behavior (e.g., Cooper and Kagel, 2005, and Feri et al., 2010).

duration of the match (that is, for the current round *and* any future rounds). The state variable of the dynamic game is the current level of team skill, which is determined by total number of investments up to that point in the match. In the second part of every round, the players engage in a Stag Hunt game where the benefit of coordination depends on the current level of team skill.[2] Specifically, the players simultaneously choose the risky *team task* or the safe *individual task*. Attempting to coordinate is risky: the players receive a payoff given by the current level of team skill only if they both choose the team task. However, when the players succeed in coordinating on the team task, they benefit from all of their own investments and all of the other player's investments in team skill up to that point in the match.

Viewed in light of Deming (2017a)'s model of team production, the team task corresponds to a specialized task that pays off only when teammates also perform complementary specialized tasks, whereas the individual task corresponds to a generic task that yields a safe payoff without requiring team coordination. Within Deming (2017a)'s framework, we can interpret investment in team skill as investment in proficiency in specialized tasks or in the ability to integrate specialized inputs into team output.[3] Our theoretical framework considers investment in team skill only in the context of a single team relationship of finite duration; however, many real-world relationships are long (e.g., professional partnerships), and we can re-interpret the cost of investment to be net of any future benefits of investment beyond the current team relationship.

To develop our hypotheses (in Section IV) we draw on the equilibrium analysis of our dynamic investment game detailed in Section II.C. In particular, we draw on predictions of the *team play* subgame-perfect Nash equilibrium (team play SPE), in which players always coordinate on the efficient team task. Despite this coordination, the players under-invest in team skill relative to the socially efficient benchmark (unless the investment cost is very low). As the match progresses, the dynamic benefit of investment declines because fewer rounds remain to benefit from the increase in team skill. In the team play SPE, the players stop investing in team skill earlier than is socially optimal because they neglect the positive externality that their investments generate for the other player. Alongside

[2]Thus, we build on the framework of coordination games (see the survey by Cooper and Weber, 2020, and the Stag Hunt game meta-study by Dal Bó et al., 2021). Kopányi-Peuker et al. (2018), Reuben and Timko (2018), and List and Shah (2022) use Weak Link games to represent a team interaction, but do not study investment in team skill.

[3]Deming (2017a) follows in the tradition of Becker and Murphy (1992)'s model of division of labor with coordination costs, while Neffke (2019) evidences the importance of worker skill complementary in teams.

the team play SPE, there also exists an *individual play* SPE in which the players always choose the safe individual task, and so never invest in team skill. To capture strategic uncertainty, we develop a simple measure of the basin of attraction of investment in team skill (that is, the set of beliefs that makes investment optimal) that takes into account the dynamic benefit of investment in the current and any future rounds, and we also use this basin measure in hypothesis development.[4]

Next, we follow a well-established literature that uses laboratory experiments to study teamwork (see the first paragraph) by collecting controlled experimental data to test our theoretical hypotheses. Section III.C describes how we take our dynamic investment game to the laboratory.[5] Over 600 subjects played the dynamic investment game nine times, with random matching into pairs at the start of each match, and with each match lasting three rounds (the first of the nine matches was an unpaid training match). Across matches, we randomly varied how much investment increased team skill. Specifically, each investment increased team skill by $b > 0$, where the value of b was chosen randomly at the start of each match, at the level of a pair of subjects, and stayed the same until the end of the match.

Our first hypothesis stems from the insight that as b increases across matches, the dynamic benefit of investment grows, because each investment increases team skill by more. Consistent with our first hypothesis, across matches we find that investment in team skill increases strongly in b ($p < 0.01$), with the investment rate increasing from under 20% to nearly 90% as b moves from its lowest to highest value (Section V.B). Our second hypothesis stems from the insight that as the rounds progress within a match, the dynamic benefit of investment falls, because fewer rounds remain to benefit from the increase in team skill. Consistent with our second hypothesis, within matches we find that investment in team skill falls as the rounds progress ($p < 0.01$), with the investment rate falling by 17 percentage points from the first to the third round (Section V.C). Furthermore, we find strong statistical support ($p < 0.01$) for predictions about the

[4]Basins of attraction complement equilibrium analysis by capturing strategic uncertainty and helping to predict behavior (see Dal Bó et al., 2021, and Boczoń et al., forthcoming, for comprehensive analyses in the Stag Hunt game and repeated social dilemmas, respectively). We know of only two experimental papers that study basins of attraction in dynamic games, namely Vespa and Wilson (2017) in a dynamic variant of the indefinitely repeated Prisoner's Dilemma and Rosokha and Wei (2024) in a server queueing problem.

[5]Andersson and Wengström (2012), Fréchette and Yuksel (2017), and Aycinena et al. (2024) also study experimentally two-part games with a Stag Hunt game played in part 2. In contrast to our setting, in these papers the two-part game is not repeated, and the game is not dynamic since choices in part 1 do not influence the Stag Hunt payoff matrix in part 2.

pattern of the relationship between investment in team skill and both the value of b and the round that are motivated by the detailed structure of the team play SPE.

To summarize, we find that investment in team skill responds strongly to incentives, and furthermore the team play SPE helps to predict the pattern of those responses. Although not predicted by the team play SPE, we also find evidence that investment helps to signal an intention to choose the team task (Section VI.A). To complement our theory-driven hypothesis testing and to better understand heterogeneity in behavior, we further use an unsupervised machine learning algorithm that learns the number, size, and shape of clusters directly from the data to identify clusters of matches with similar within-cluster behavior (Section VI.C).

Recall that in the team play SPE, players under-invest in team skill because they neglect positive externalities of their investments and therefore stop investing earlier than is socially optimal. Moreover, even when investment is predicted by the team play SPE, investing in team skill is risky because subjects might fail to coordinate on the team task. Consistent with this, in our experiment we observe under-investment in team skill, and subjects achieve full social efficiency in a match only 43% of the time (Section VI.B analyzes in detail patterns of deviation from the efficient benchmark). Even though our subjects fail to achieve full efficiency in the majority of matches, investment in team skill is nonetheless substantially higher than the counterfactual where subjects follow the individual play SPE by always choosing the safe individual task and therefore never investing in team skill. Furthermore, we find that the proportion of matches with fully efficient choices increases with b, which indicates that appropriate incentives can help people to make better investment decisions in teams. For instance, a principal can raise b by increasing the share of revenue that team members retain when they coordinate successfully.

Section V.D turns to the effects of individual traits. Theory of mind is the ability to understand the mental states of others, such as their beliefs, desires, intentions and emotions (e.g., Fe et al., 2022), and we measured theory of mind ability using the Reading the Mind in the Eyes Test (RMET; Baron-Cohen et al., 2001), which requires subjects to identify emotions expressed in photographs of a person's eyes (see Section III.D for details). Our bespoke Coordination Attraction Score (CAS) captures subjects' propensity to coordinate across seven Stag Hunt games, which we measured before subjects started playing the dynamic investment game (see Section III.B for details). We hypothesize that theory of mind and CAS help subjects coordinate on the team play SPE, and thus help them choose efficient dynamic investments in team skill when such investments are predicted by the team play SPE. We pre-registered these two measures, alongside cognitive ability, as our only individual-level predictors of investment in team skill. Consistent with our third hypothesis, we find that when the team play SPE predicts investment, subjects with higher theory of mind ability and a higher Coordination Attraction Score are more likely to invest in team skill ($p < 0.02$ and $p < 0.01$, respectively).[6] These findings indicate that selecting the right people into teams according to their observable traits facilitates the dynamic development of teamwork skills.

Our finding that theory of mind predicts investment in team skill complements a growing literature that links theory of mind and team behavior. Deming (2017b) highlights that successful teamwork requires theory of mind, which allows teammates to understand each other's motivations and intentions. Weidmann and Deming (2021)'s laboratory experiment identifies team players, that is people who consistently cause their team to exceed its predicted performance, and finds that these team players exhibit higher theory of mind measured using the RMET.[7] Relatedly, theory of mind predicts team performance (Almaatouq et al., 2024), collective intelligence (defined as a group's ability to perform a range of tasks; Woolley et al., 2010, Riedl et al., 2021), and cooperation in teams via verbal communication (Markiewicz et al., 2024); while organizational psychology links broader emotional intelligence to team performance (e.g., Feyerherm and Rice, 2002). We also complement the nascent literature in experimental economics that studies how theory of mind influences the strategic behavior of adults (e.g., Corgnet et al., 2018, Lang et al., 2018, and Ridinger and McBride, 2025, in a trading game, the Ultimatum Game, and the Prisoner's Dilemma, respectively).[8]

Our work also contributes to the emerging literature in experimental economics that studies behavior in dynamic games, where choices in one period directly shape the game structure (e.g., payoff functions or available actions) in subsequent periods (see, e.g., Herr

[6] Our finding that CAS predicts investment in team skill complements contemporaneous work by Dal Bó and Fréchette (2025), who find that subjects who choose Stag (in a single Stag Hunt game) are more likely to cooperate in the indefinitely repeated Prisoner's Dilemma.

[7] Weidmann and Deming (2021) examine the static relationship between theory of mind and team player ability, while we focus on the link between theory of mind and dynamic investment in team skill.

[8] Fe et al. (2022) summarize evidence that theory of mind operates as a skill and not through preferences. Consistent with this, Ridinger and McBride (2025) find a positive effect of theory of mind on cooperation in the sequential one-shot Prisoner's Dilemma that operates via belief accuracy.

et al., 1997, Dal Bó et al., 2018, Vespa and Wilson, 2019, Lee et al., 2023, Rosokha et al., 2024). Battaglini et al. (2012, 2016) and Agranov et al. (2016) study durable public goods games: with indefinite repetition, Battaglini et al. (2016) find that accumulation of the public good is inefficiently slow, while in a two-period game with legislative bargaining, Agranov et al. (2016) distinguish static and dynamic inefficiency and find that investment in the public good is lower in the second period. Casiora and Ciccone (2021) find that a single investment opportunity increases cooperation in the indefinitely repeated Prisoner's Dilemma (IRPD), where investment affects only the investor (by increasing her payoff from choosing the cooperative action, irrespective of the other player's behavior).[9,10]

Finally, our work links to the experimental literature on the evolution of behavior in repeated games (e.g., Dal Bó and Fréchette, 2011, Fudenberg et al., 2012, Fiala and Suetens, 2017, Embrey et al., 2018, Ghidoni and Suetens, 2022, Aoyagi et al., 2024, Camera and Gioffré, 2025). Since these repeated games are not dynamic, the constant stage game cannot be influenced by prior investments as in our dynamic game setting. Nonetheless, our work complements the repeated games literature that seeks to investigate factors that foster cooperative behavior in the presence of equilibrium multiplicity (see the meta-study by Dal Bó and Fréchette, 2018, see Proto et al., 2019, 2022, who find that cognitive ability predicts cooperation, and see Cooper and Kagel, 2023, who find that teams cooperate more than individuals).

Section II constructs our theoretical framework; Section III describes our experimental design; Section IV develops our hypotheses; Section V tests those hypotheses; Section VI presents further analyses; and Section VII concludes.

[9] Benoît et al. (2017) also study how the volatility of returns affects a single investment in the IRPD, where investment increases the expected returns to both cooperation and defection.

[10] Our work also connects to the experimental literature on relationship-specific investments (see the survey by Yang, 2021); however, in our setting there is no conflict over surplus division or hold-up problem, since both players benefit from successful coordination on the team task.

II Theoretical framework

II.A Structure of the dynamic investment game

Two players, $i \in \{1, 2\}$, repeatedly play a two-part stage game for $N \geq 2$ rounds. We call this N-round game a supergame.

In part 1 of each round, the players simultaneously choose whether or not to invest in *team skill*, where investment incurs a sunk cost $c > 0$. Whenever a player invests, team skill increases by $b > 0$ for the *duration of the supergame* (that is, for the current round and any future rounds of the supergame). Let T_0 denote the initial level of team skill at the beginning of the supergame, and let $y_{i,n} \in \{0, 1\}$ denote player i's investment decision in part 1 of round n, where $y_{i,n} = 1$ denotes the choice to invest and $y_{i,n} = 0$ denotes the choice to not invest. Then team skill in part 2 of round n is given by

$$T_n = T_0 + b \sum_{x=1}^{n} (y_{1,x} + y_{2,x}). \tag{1}$$

Therefore, team skill T_n is a state variable that depends on the total number of investments in team skill up to that point in the supergame, with each investment contributing an increment of b.

In part 2 of each round, after observing the investment decisions in part 1, the players simultaneously choose the team task or the individual task. Figure 1 illustrates the commonly known task choice payoff matrix in part 2 of round n.

	Team task	Individual task
Team task	T_n , T_n	M , I
Individual task	I , M	I , I

Figure 1: Task choice payoff matrix in part 2 of round n

We assume that $T_0 > I > M$, which implies that $T_n > I > M$, and so this task choice payoff matrix has the structure of a Stag Hunt game. In the payoff-dominant Nash equilibrium of this payoff matrix, the players coordinate on the team task and each receives a payoff given by the current level of team skill, T_n. However, attempting to coordinate is risky: when a player tries to coordinate on the team task but ends up choosing the team task alone, she receives M, which is lower than the safe payoff from choosing the individual task, I. As a result, both players choosing the safe individual task is also a Nash equilibrium.

Deming (2017a)'s model of team production can help to motivate this dynamic investment game. In Deming (2017a)'s model, teamwork builds on comparative advantage: successful teamwork requires workers to perform specialized tasks and to transform specialized inputs into valuable team output. Viewed in the light of Deming (2017a)'s model, choosing the team task in part 2 of a round in our game corresponds to performing one's specialized task, which only pays off when others also perform their complementary specialized tasks, whereas opting for the individual task in part 2 of a round corresponds to working on a generic task that yields a safe payoff without requiring team coordination. Within Deming (2017a)'s framework, we can interpret investment in team skill as, for example, investment in enhancing one's proficiency in the specialized task or investment in the ability to transform specialized inputs into team output (which Deming, 2017a, calls "trading tasks"), which increase the payoff from successful team coordination.

We emphasize four key properties of our dynamic investment game. First, investment in team skill is risky, because the investment creates a benefit only when the players successfully coordinate on the team task. Second, one player's investment in team skill creates a positive externality for the other player when they coordinate on the team task, because both players benefit from the fact that the investment increases team skill by b. Third, the game is dynamic because investment creates a permanent increase in team skill that persists until the end of the supergame. Fourth, and relatedly, the dynamic benefit of investment declines as the supergame progresses, because fewer rounds remain to potentially benefit from the increase in team skill.

Appendix A.2 provides further discussion of the structure of the dynamic investment game, for example noting that we can re-interpret the cost of investment to be net of any future benefits of investment beyond the current supergame.

II.B Social efficiency

Irrespective of the history of investments, it is always socially efficient for both players to choose the team task in part 2 of every round. This follows immediately from the Stag Hunt structure of the task choice payoff matrix in part 2 of a round when the players choose between the team task and the individual task ($T_0 > I > M$, and so $T_n > I > M$), which makes successful team coordination efficient.

Remark 1. *Both players choosing the team task is socially efficient in all rounds.*

Assuming the players always choose the socially efficient team task, and with $k = N - n + 1$ rounds remaining (including the current round n), investment in team skill in round n is socially efficient when $2bk \geq c$, since investment by player i benefits both players by increasing team skill by b in all k remaining rounds, and c is the investment cost. Thus, we get:

Remark 2. *Investment in team skill is socially efficient iff the number of rounds remaining $k \geq \frac{c}{2b}$. Therefore:*

- *When $2b \geq c$, investment in team skill (by both players) is socially efficient in all rounds.*
- *When $2bN \geq c > 2b$, investment in team skill (by both players) is socially efficient only for the first q rounds, where $q = N - \lceil \frac{c}{2b} \rceil + 1$ and $q \in [1, N - 1]$.*[11]
- *When $c > 2bN$, investment in team skill is never socially efficient.*

When the investment cost is sufficiently low, investment in team skill is efficient in all rounds. However, for intermediate investment costs, investment in team skill eventually becomes inefficient as the supergame's end approaches. This occurs because, as noted in Section II.A, the dynamic benefit of investment declines as the supergame progresses, with fewer rounds remaining to benefit from the increase in team skill. The higher the investment cost, the fewer the number of rounds for which investment in team skill is efficient, with investment inefficient in all rounds for sufficiently high investment cost.

[11] Investment is efficient until the number of rounds remaining $k = N - n + 1$ falls to $\lceil \frac{c}{2b} \rceil$, where $\lceil x \rceil$ denotes x rounded up to the nearest integer.

II.C Equilibrium analysis

We focus on pure-strategy subgame-perfect Nash equilibria (SPE), making the tiebreak assumption that players invest in team skill when indifferent.

II.C.1 Unconditional choice of the individual task

First, we focus on SPE where the players always choose the socially inefficient individual task, unconditionally on the history of play.

At the beginning of the supergame, or after any history of play over some rounds, if the other player's strategy includes choosing the individual task unconditionally in every round until the end of the supergame, the unique best response is to also choose the individual task in every round (to receive $I > M$) and to never invest in team skill (since investment never yields a benefit absent coordination on the team task). Thus, we get:

Proposition 1. *There exists a unique SPE in which the players always choose the individual task unconditionally. In this SPE, the players never invest in team skill.*

We call this the **individual play SPE**. In this equilibrium, the players always coordinate on the safe but inefficient individual task. Given coordination on the individual task, investment in team skill yields no benefit, and so no investment occurs.

II.C.2 Unconditional choice of the team task

Next, we focus on SPE where the players always choose the socially efficient team task, unconditionally on the history of play.

Starting from the beginning of the supergame, or after any history of play over some rounds, if the other player's strategy includes choosing the team task unconditionally in every round until the end of the supergame, and includes investment decisions that are unconditional in every round (but potentially round dependent), the unique best response is to also choose the team task in every round (to receive $T_n > I$).[12] Furthermore, investment in team skill is optimal for all rounds where, with k rounds remaining (including

[12]By backward induction, in any SPE in which the players always choose the team task unconditionally, their investment decisions must also be unconditional on the history of play (though potentially round dependent). In the final round, given unconditional choices of the team task, optimality of investment depends only on whether $bk \geq c$ (for $k = 1$ rounds remaining), and so investment decisions must be unconditional. An analogous argument applies in the penultimate round, given unconditionality of task choices and investment decisions in the final round. The argument then continues by backward induction.

the round under consideration), $bk \geq c$, since investment benefits the player by increasing team skill by b in all those k remaining rounds, c is the investment cost, and investment decisions do not influence future behavior. Thus, we get:

Proposition 2. *There exists a unique SPE in which the players always choose the team task unconditionally. In this SPE, the players invest in team skill iff the number of rounds remaining $k \geq \frac{c}{b}$. Therefore, and comparing to Remark 2:*

- *When $b \geq c$, the players invest in team skill in all rounds, which is socially efficient.*
- *When $2b \geq c > b$, the players invest in team skill only for the first $N-1$ rounds, while investment is socially efficient in all rounds.*
- *When $bN \geq c > 2b$, the players invest in team skill only for the first w rounds, where $w = N - \lceil \frac{c}{b} \rceil + 1$ and $w \in [1, N-2]$, while investment is socially efficient for the first $q > w$ rounds.*[13]
- *When $2bN \geq c > bN$, the players never invest in team skill, while investment is socially efficient for the first $q \geq 1$ rounds.*
- *When $c > 2bN$, the players never invest in team skill, which is socially efficient.*

We call this the **team play SPE**. In this equilibrium, the players always coordinate on the efficient team task, but nonetheless under-invest in team skill relative to the socially efficient benchmark (unless the investment cost is very high or very low). Specifically, as the supergame progresses, the players stop investing in team skill earlier than is socially optimal. This underinvestment in team skill arises because the players neglect the positive externality that their investments generate for the other player (in the current and any future rounds), resulting in a private dynamic benefit of investment that falls short of the corresponding social dynamic benefit.

II.C.3 Conditional task choices

So far, we have considered only SPE in which task choices are unconditional on the history of play. In Appendix A.3, we extend the analysis to SPE in which the players condition task choices on investment decisions, in particular choosing the team task in part 2 of a round iff both players invested in team skill in part 1 of the same round.

[13] The players invest until the number of rounds remaining $k = N - n + 1$ falls to $\lceil \frac{c}{b} \rceil$, where $\lceil x \rceil$ denotes x rounded up to the nearest integer. Note $q > w$, since $\lceil \frac{c}{b} \rceil > \lceil \frac{c}{2b} \rceil$, given $c > 2b$.

Under a mild assumption, Proposition A.1 shows that such within-round conditional play allows a SPE with fully efficient task choices and investment decisions. However, this SPE requires coordination on the inefficient individual task off the equilibrium path, to "punish" failures to invest in team skill. Four detailed bullet points in Appendix A.3 describe why, in the setting of our dynamic investment game, the requirement for costly off-equilibrium punishment likely makes this SPE harder to sustain, compared to the team play SPE with unconditional play of the efficient team task (from Proposition 2).

We further note that within-round conditional play can be counter-productive by leading to socially inefficient *over-investment* in team skill (Appendix A.3 provides the details).

Finally, we note that in this subsection we have considered only SPE in which players condition within round. For simplicity, we abstract from SPE in which players condition across rounds, given that within-round conditional play can achieve full efficiency (Proposition A.1), and given that across-round conditional responses to current choices have no bite in the final round of the supergame.

III Experimental design

III.A Procedures

We collected experimental data from 606 student subjects at the Vernon Smith Experimental Economics Laboratory (VSEEL) at Purdue University in January and February of 2025 (AEARCTR-15260; Purdue IRB-2024-997). At the beginning of the experiment, subjects electronically provided consent to participate. The experiment was programmed in oTree (Chen et al., 2016). Appendix B provides screenshots from the experiment

We ran 30 sessions that lasted about 90 minutes and were identical to each other, except for variation in the number of subjects (mean 20.2) due to show-up rate fluctuation.[14] For each session, we randomly invited subjects from the VSEEL subject pool (administered using ORSEE; Greiner, 2015) without any exclusion restrictions. We converted experimental points at the rate of 125 points = \$1.00. On average, subjects earned \$32.28, including a show-up fee of \$5.00.

[14]We pre-registered our plan to run sessions until we reached 600 subjects. We exclude a small number of pilot sessions that we ran before pre-registering the experiment and which used different parameter values.

Subjects read instructions on a computer screen. In the context of coordination game experiments, Chen et al. (2021) show that common information is important. To induce common information, we told subjects: "Throughout the session, all participants will be given exactly the same instructions, and we will not deceive you in any way."

III.B Stag Hunt game

In Section 1 of the experiment, subjects played the Stag Hunt game seven times with random matching at the beginning of each game, and without feedback (to avoid contaminating behavior in Section 2 of the experiment with learning from experience in Section 1). The screenshots for Section 1 start at Appendix B, page 2.

Figure 2 shows how we presented the payoff matrix to the subjects, where in each of the seven periods, K was replaced with a period-specific value $K_p \in [20, 60]$.[15,16] In this Stag Hunt game, choosing Hare guarantees a payoff of K_p. Instead of choosing the safe Hare, subjects might instead choose the risky Stag in an attempt to coordinate on the payoff-dominant Stag-Stag Nash equilibrium. Subjects had 30 seconds to make each decision, after which a flashing reminder to make their decision appeared on the screen.[17]

Your choice:	X	X	Y	Y
Other's choice:	X	Y	X	Y
Your payoff (points):	70	10	K	K
Other's payoff (points):	70	K	10	K

Figure 2: Stag Hunt game payoff matrix

Section 1 serves two purposes. First, Section 1 trains subjects to understand the Stag Hunt game, which helps subjects to understand the dynamic investment game in Section 2 of the experiment, where the task choice payoff matrix in the second part of

[15]Duffy and Feltovich (2002) use the same Stag Hunt parameters, with $K = 55$.

[16]$K_1 = 50$; $K_2 = 35$; $K_3 = 20$; $K_4 = 40$; $K_5 = 60$; $K_6 = 45$; $K_7 = 30$. We presented payoff matrices to subjects in this format throughout the experiment. The format is designed to make payoffs clear to subjects who are not familiar with the matrix presentation common in game theory textbooks. Gill and Rosokha (2024) use the same format in the context of the IRPD.

[17]We chose fixed decision time limits to prevent subjects choosing quickly to make the experiment move faster, with the aim of encouraging cognitive effort and thus better mimicking real-world environments with higher stakes (e.g., Gill and Prowse, 2016, 2023, also use fixed decision times in the context of repeated games). We used decision times from pilot data to help set decision time limits (footnote 14 mentions the pilot sessions).

each round has the structure of a Stag Hunt game (with payoffs influenced by earlier investment decisions). Second, Section 1 allows us to study whether subjects' propensity to coordinate predicts their likelihood of investing in team skill in Section 2. Specifically, we use choices in Section 1 to compute each subject's **Coordination Attraction Score (CAS)**, which we pre-registered as a predictor of the likelihood of investing in team skill in Section 2 of the experiment.

Before defining CAS, we introduce the basin of attraction of Stag. The size of the basin is given by the "maximum probability of the other subject playing hare that still makes stag a best response" (Dal Bó et al., 2021). As this basin increases in size, attempting to coordinate on the payoff-dominant Stag-Stag equilibrium becomes less risky, in the sense that Stag becomes optimal for a larger range of beliefs about the other choosing Hare (and Stag is called risk dominant when the basin size exceeds one-half). Dal Bó et al. (2021) show empirically that the size of the basin of attraction positively predicts the frequency of Stag choices, while Alaoui et al. (2024, App. A.3.3) show that a cost-benefit model of stepwise reasoning can rationalize the payoff-dominant equilibrium even for some basins of Stag below one-half.

In our setting, $\phi_p = \frac{70-K_p}{60}$ measures the basin of attraction of Stag in period p. Let $z_{i,p} \in \{0,1\}$ denote subject i's choice in period p, with $z_{i,p} = 1$ denoting a choice of Stag and $z_{i,p} = 0$ denoting a choice of Hare. Then:

$$\text{CAS}_i := \frac{\sum_{p=1}^{7} \phi_p z_{i,p}}{\sum_{p=1}^{7} \phi_p} \in [0,1]. \tag{2}$$

That is, subject i's Coordination Attraction Score measures the frequency with which that subject chooses Stag in Section 1, weighting each choice of Stag by the size of the basin of attraction of Stag in that period, and normalizing by the sum of the basin sizes so that CAS lies between zero and one.

We intentionally formulated the Coordination Attraction Score to assign higher values to subjects whose choices respond more strongly to the attractiveness of attempting to coordinate on the payoff-dominant equilibrium. To illustrate, consider Ann who perfectly follows a threshold rule, choosing Stag iff its basin size lies above her threshold, and Bob who chooses randomly. Ann's threshold perfectly predicts her CAS, and conditional on choosing Stag the same number of times as Bob, Ann will have a higher CAS than Bob (strictly higher unless Bob's random choices happen to perfectly mimic Ann's threshold rule). Rankin et al. (2000) and Dal Bó et al. (2021) study subjects who follow threshold rules like Ann's, but with some decision error.

III.C Dynamic investment game

In Section 2 of the experiment, subjects played the dynamic investment game described in Section II.A nine times, with random matching at the beginning of each of the nine supergames. In the instructions, we refer to supergames as "matches". As we describe below, the first of the nine matches was an unincentivized training match. The screenshots for Section 2 start at Appendix B, page 4, with the first page providing the instructions.

First, the instructions explain that Section 2 consists of nine matches, with random matching into pairs at the start of each match, and with each match lasting three rounds.[18] Second, the instructions explain that in each round of a match, each subject in the pair will choose the team task or the individual task, with the payoff matrix presented as in Figure 3.[19] Third, the instructions explain that: (i) in each match the starting level of team skill will be $T = 87$; and (ii) in each round of match, before choosing the team task or the individual task, each subject in the pair will choose whether or not to invest in team skill, with each investment costing 15 points and increasing the level of team skill by B units for the rest of the match (that is, for the current round and any future rounds). Finally, the instructions explain that B will be chosen randomly at the start of each match, and will stay the same until the end of the match. Appendix A.4 discusses our choice to use contextualized framing in the experiment.

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	T (team skill)	17	73	73
Other's payoff (points):	T (team skill)	73	17	73

Figure 3: Task choice payoff matrix (as presented in the instructions for Section 2)

When a match begins, a welcome screen provides the pair of subjects with the specific value of B for that match, together with a brief reminder of the instructions (e.g., see Appendix B, page 6). As the pair of subjects progresses through the match, the top of the

[18]We chose three rounds because we judged that three rounds is the smallest number that allows us to study rich dynamics, with a beginning round, a middle round, and a final round.

[19]Footnote 16 explains why we presented payoff matrices in this format.

screen always shows the specific B for that match, along with the current level of team skill. In part 2 of each round, the screen provides feedback on the investment choices in part 1 of the same round (and their impact on the level of team skill), together with the task choice payoff matrix as presented in Figure 3, but with T replaced by its current level (e.g., see Appendix B, page 8). At the end of each round, a feedback screen provides feedback for that round, including the investment choices, task choices, payoffs from each part of the round, and total round payoffs (e.g., see Appendix B, page 9). As in Section 1, subjects had fixed decision time limits.[20] The screenshots show all of the screens for two complete matches, from the perspective of one hypothetical subject.

Linking to the parameters of the dynamic investment game in Section II.A, in the experimental implementation of the game: (i) each supergame (or "match") lasted $N = 3$ rounds; (ii) the investment cost $c = 15$; and (iii) each investment increased team skill by b, where at the beginning of each supergame, and at the level of the pair of subjects, b was drawn uniformly from $\{2, 4, 6, 8, 10, 12, 14, 16, 18, 20\}$. Note that, to enhance readability, in the instructions we used B to represent b from Section II.A. Furthermore, the initial level of team skill $T_0 = 87$, the safe payoff from the individual task $I = 73$, and the payoff from choosing the team task alone $M = 17$.

The first of the nine matches was an unpaid *training match*, which we exclude from all empirical analyses. We included a training match because the dynamic investment game is somewhat complex, and we wanted to help subjects understand the game before making incentivized decisions. We told subjects that the training match is an opportunity to explore how matches work without any consequences for their earnings. In the training match, we set $b = 10$, and points did not contribute to earnings (we reminded subjects of this at the end of each round). Otherwise, the training match was identical to the other eight matches.

III.D Tests and demographic questionnaire

In Section 3 of the experiment, subjects completed a test of cognitive ability followed by a test of theory of mind. Each test lasted 10 minutes. We paid subjects \$2 for completing each test, but following the psychometric literature we did not pay for performance in the

[20]Footnote 17 explains why we used fixed decision time limits. In Section 2, subjects had 20 seconds to make their investment choice in part 1 of a round and 25 seconds to make their task choice in part 2 of a round (including review of the feedback on the investment choices in part 1 of the same round). Subjects also had 25 seconds to review the end-of-round feedback.

tests. After the tests, subjects completed a brief demographic questionnaire that asked about gender and age (available starting at Appendix B, page 30).

Theory of mind is the ability to understand the mental states of others (see Fe et al., 2022, Section 2.1, for a detailed description and history of the construct). To measure theory of mind ability, we used the 36-item Reading the Mind in the Eyes Test (RMET) from Baron-Cohen et al. (2001). Each item requires the subject to identify the emotion (from a choice of 4) expressed in a photograph of a person's eyes (see Appendix B, page 29, for a sample item). To avoid a confound with verbal understanding, we provided the physical RMET handout that defines the emotions mentioned in the test (this is the standard RMET procedure). The RMET is the leading test of social-perceptual theory of mind (which is the ability to understand mental states using perceptual cues such as facial expressions), and the RMET has been used recently in economics to measure theory of mind by, e.g., Weidmann and Deming (2021) and Ridinger and McBride (2025).

To measure cognitive ability, we used the 11-item test of matrix reasoning from the International Cognitive Ability Resource (Dworak et al., 2021; https://icar-project.com), which has been used recently in economics by Gill and Rosokha (2024) and Gill et al. (2025). This non-verbal test is similar to Raven's Progressive Matrices (Raven et al., 2000): each item requires the subject to identify the missing element that completes a visual pattern in a matrix (see Appendix B, page 27, for a sample item). Matrix reasoning is a leading measure of cognitive ability (Gray and Thompson, 2004, Box 1) and in economic settings predicts belief accuracy (e.g., Charness et al., 2018) and strategic ability (see, e.g., Gill and Prowse, 2016, and also the survey by Sofianos, 2025).

IV Development of hypotheses

To develop our hypotheses, we draw on the equilibrium analysis from Section II.C. In particular, we draw on the team play SPE described in Proposition 2, in which the players always coordinate on the socially efficient team task in every round of a supergame. Although we draw on the team play SPE to develop our hypotheses, we also recall the individual play SPE described in Proposition 1, in which the players always coordinate on the inefficient individual task, and therefore never invest in team skill.[21]

Recall that in our experimental implementation of the dynamic investment game,

[21] In Appendix A.3, we also construct an efficient SPE using conditional task choices, but we explain there why such a SPE is likely harder to sustain, compared to the team play SPE.

each supergame lasted $N = 3$ rounds, the investment cost $c = 15$, and each investment increased team skill by b for the rest of the supergame, where at the beginning of each supergame b was drawn uniformly from $\{2, 4, ..., 20\}$. For these parameters, the left panel of Table 1 describes, for each round, whether or not the players choose to invest in team skill in the team play SPE. For comparison, the right panel of Table 1 describes whether investment in team skill is socially efficient.[22]

Table 1: Investments in team skill, in the team play SPE and socially efficient benchmark: Choices and basins of attraction

	SPE investment: choices & basins				Efficient investment: choices & basins			
b	Round 1	Round 2	Round 3	Total	Round 1	Round 2	Round 3	Total
2	N/0.000	N/0.000	N/0.000	0	N/0.000	N/0.000	N/0.000	0
4	N/0.000	N/0.000	N/0.000	0	Y/0.375	Y/0.063	N/0.000	2
6	Y/0.167	N/0.000	N/0.000	1	Y/0.583	Y/0.375	N/0.000	2
8	Y/0.375	Y/0.063	N/0.000	2	Y/0.688	Y/0.531	Y/0.063	3
10	Y/0.500	Y/0.250	N/0.000	2	Y/0.750	Y/0.625	Y/0.250	3
12	Y/0.583	Y/0.375	N/0.000	2	Y/0.792	Y/0.688	Y/0.375	3
14	Y/0.643	Y/0.464	N/0.000	2	Y/0.821	Y/0.732	Y/0.464	3
16	Y/0.688	Y/0.531	Y/0.063	3	Y/0.844	Y/0.766	Y/0.531	3
18	Y/0.722	Y/0.583	Y/0.167	3	Y/0.861	Y/0.792	Y/0.583	3
20	Y/0.750	Y/0.625	Y/0.250	3	Y/0.875	Y/0.813	Y/0.625	3

Notes: N/Y are short for No/Yes. The team play SPE choices come from Proposition 2 and the socially efficient choices come from Remark 2. The formula for the size of the basin in the left panel is in footnote 23. The size of the basin in the right panel is calculated in the same way, but assuming a player who maximizes joint payoffs, thus giving the size of the basin as $\max\{0, 1 - \frac{c}{2bk}\}$. When the size of the basin is zero, in all cases here the basin is the empty set (i.e., there is no belief that makes investment optimal).

From Table 1, when $b \in \{16, 18, 20\} > c = 15$, in the team play SPE the players invest in team skill in all three rounds, which is socially efficient. When $b \in \{4, 6, 8, 10, 12, 14\} < c$, in the team play SPE the players invest in team skill for fewer rounds than is socially

[22]Note, the specific values of T_0, I, and M do not affect investment behavior in the team play SPE or efficient investment choices.

efficient. As the supergame progresses, the dynamic benefit of investment declines, with fewer rounds remaining to benefit from the increase in team skill. For these intermediate values of b, the players stop investing in team skill earlier than is socially optimal because they neglect the positive externality that their investments generate for the other player. Finally, for $b = 2$, in the team play SPE the players never invest in team skill, which is socially efficient.

Equilibrium analysis provides sharp predictions, but ignores the role of strategic uncertainty. To capture strategic uncertainty, the left panel of Table 1 reports basins of attraction of investment. To calculate the basin of investment, we suppose that with k rounds remaining (including the current round), a player believes with probability β_k that the other player will always choose the team task and make investment decisions that are unconditional (as per the team play SPE described in Proposition 2), and believes with probability $1 - \beta_k$ that the other player will always choose the individual task (as per the individual play SPE described in Proposition 1). The basin of attraction of investment is then the set of beliefs that makes investment optimal, taking into account the dynamic benefit of investment in the current and any future rounds.[23] As this basin increases in size, investing in team skill becomes less risky, in the sense that investment becomes optimal for a larger range of beliefs. We hypothesize that investment in team skill increases with the size of this basin of attraction. Furthermore, Table 1 shows that the size of the basin of investment increases in b, and declines as the rounds progress.[24]

The basin of attraction of the team task can also incentivize investment in team skill, by directly changing beliefs. If subjects anticipate that coordination on the team task is more likely when the basin of the team task is larger, then investment in team skill becomes more attractive as the team task basin grows. Table A.1 in Appendix A.1 reports the basins of the team task. Before any investment, the size of the basin is $\frac{1}{5}$, which is a common parameter choice in the experimental Stag Hunt game literature (see the notes to Table A.1). The size of the basin of the team task increases in team skill, and so increases in b for any positive number of investments in team skill, and increases in the number of investments for any b (see Table A.1).

Based on this discussion, we are now ready to develop our hypotheses.

[23] Investment is optimal iff $\beta_k bk \geq c$. Thus, the size of the basin is $\max\{0, 1 - \frac{c}{bk}\}$.

[24] We pre-registered the basin of attraction of investment, defining it and stating that we use it in hypothesis formation. Meta-studies show that basin size predicts behavior in the Stag Hunt game (Dal Bó et al., 2021) and in the IRPD (Dal Bó and Fréchette, 2018).

Hypothesis 1. *Across matches, investment in team skill increases in b.*

As b increases across matches, the dynamic benefit of investment grows, because each investment increases team skill by more. From the left panel of Table 1, the team play SPE predicts investment in team skill once b reaches a round-dependent threshold. Furthermore, within the range of values of b where investment occurs in the team play SPE, the basin of attraction of investment expands as b increases. Additionally, the basin of attraction of the team task also expands in b, further enhancing the attractiveness of investment.

Hypothesis 1a. *Investment in team skill increases more between successive b values when the team play SPE predicts a change from not investing to investing.*

From the left panel of Table 1, the team play SPE predicts that the investment decision changes from not investing to investing in the first round when b changes from 4 to 6, in the second round when b changes from 6 to 8, and in the third round when b changes from 14 to 16. In those three threshold cases, we hypothesize that investment in team skill increases more, compared to the adjacent changes in b (where the team play SPE does not predict a change in the investment decision). This hypothesis is guided by the detailed structure of the team play SPE prediction, while allowing for the impact of strategic uncertainty, behavioral noise, and equilibrium multiplicity.

Hypothesis 2. *Within matches, investment in team skill falls as the rounds progress. The decline from the second to the third round is larger than the decline from the first to the second round.*

As the rounds progress within a match, the dynamic benefit of investment falls, because fewer rounds remain to benefit from the increase in team skill. From the left panel of Table 1, for intermediate values of b, the team play SPE predicts that investment in team skill stops before the end of the supergame. Furthermore, investment stops more frequently between the second and third rounds (for $b \in \{8, 10, 12, 14\}$) than between the first and second rounds (for $b = 6$ only). Additionally, the basin of attraction of investment contracts as the rounds progress, and contracts more on average between the second and third rounds than between the first and second rounds.[25]

[25]There are two countervailing factors. First, the basin of the team task expands in the number of investments. Second, beliefs could become more optimistic as the rounds progress.

Hypothesis 2a. *From one round to the next, investment in team skill falls more when the team play SPE predicts that investment stops.*

From the left panel of Table 1, the team play SPE predicts that investment stops between the first and second rounds for $b = 6$, and stops between the second and third rounds for $b \in \{8, 10, 12, 14\}$. In those five threshold cases, we hypothesize that investment in team skill falls more, compared to the adjacent round transitions for the same b values (where the team play SPE does not predict a change in the investment decision). This hypothesis is guided by the detailed structure of the team play SPE prediction, while allowing for the impact of strategic uncertainty, behavioral noise, and equilibrium multiplicity.

Hypothesis 3. *Subjects with higher theory of mind, cognitive ability, and CAS are more likely to invest in team skill, particularly when the team play SPE predicts investment.*

As described in Section III.B, subjects with higher CAS have a higher propensity to coordinate in the Stag Hunt game (as measured in Section 1 of our experiment). Similarly, individuals with higher cognitive ability cooperate more in the indefinitely repeated Prisoner's Dilemma when both cooperation (using, e.g., Grim) and Always Defect are SPE (Proto et al., 2019, 2022). Additionally, individuals with higher theory of mind ability better understand others' intentions in games (Pelligra et al., 2015, Fe et al., 2022).[26] We hypothesize that these traits and behaviors—shaped by theory of mind, cognitive ability, and CAS—will help subjects to coordinate on the team play SPE, and thus help them to choose efficient dynamic investments in team skill when such investments are predicted by the team play SPE. We note that we pre-registered theory of mind, cognitive ability and CAS as the only three individual-level predictors of investment behavior.

V Testing of hypotheses

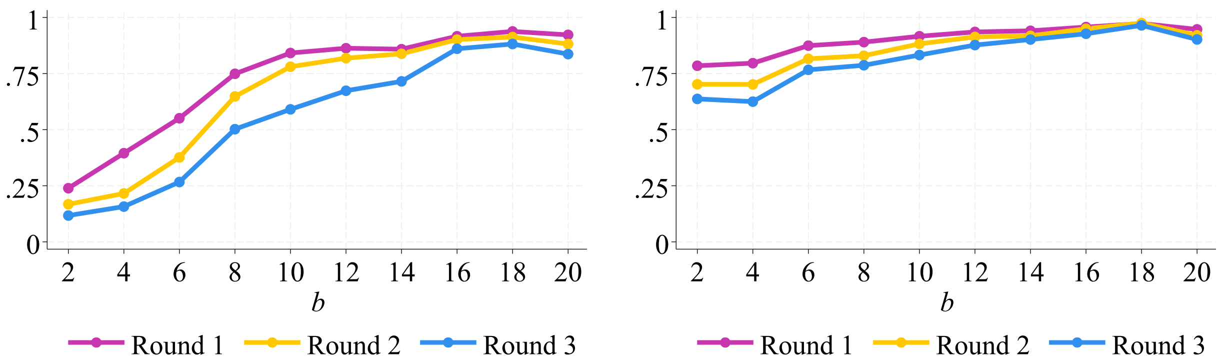
In this section, we find support for the hypotheses developed in Section IV and based on the predictions of the team play SPE. Before turning to formal testing of our hypotheses, in the next subsection we first summarize visually experimental behavior.

[26] Deming (2017b) highlights that theory of mind helps teammates understand each other's intentions; our introduction describes the growing literature that links theory of mind and team behavior.

V.A Visual summary of behavioral patterns

Subjects invest in team skill 65% of the time. The left panel of Figure 4 shows that the rate of investment increases sharply in b (across matches) and falls over rounds (within matches). These patterns are qualitatively consistent with the predictions of the team play SPE, which underpin the hypotheses developed in Section IV. The left panel of Figure 4 further shows that the drop in investment between rounds 2 and 3 is largest when the team play SPE predicts that investment stops between rounds 2 and 3 (for $b \in \{8, 10, 12, 14\}$; see Table 1 in Section IV).

Subjects choose the team task 86% of the time. The right panel of Figure 4 shows that the rate of team task choice increases modestly in b (across matches) and falls modestly over rounds (within matches), reflecting an attenuated version of the investment pattern from the left panel. Recall that in the team play SPE, the players always coordinate on the efficient team task. This sharp prediction ignores strategic uncertainty. Higher b makes both investment and the team task more attractive by enlarging their basins of attraction (see Section IV). Furthermore, in Section VI.A, we present causal evidence that investment increases the likelihood that the other subject chooses the team task in the same round, likely because investment signals an intention to choose the team task.



(a) Rate of investment in team skill

(b) Rate of team task choice

Figure 4: Rates of investment and team task choice by b and round

Turning to efficiency, as shown in Figure 5, subjects achieve full social efficiency in a match 43% of the time (Section VI.B provides a detailed analysis of deviations from the efficient benchmark).

Figure 5 further indicates that there was little learning on average over matches in our experiment: the rates of investment, team task choice and efficiency remain stable as the matches progress (as noted in Section IV, we exclude the unpaid training match (i.e., Match 1) from all empirical analyses).

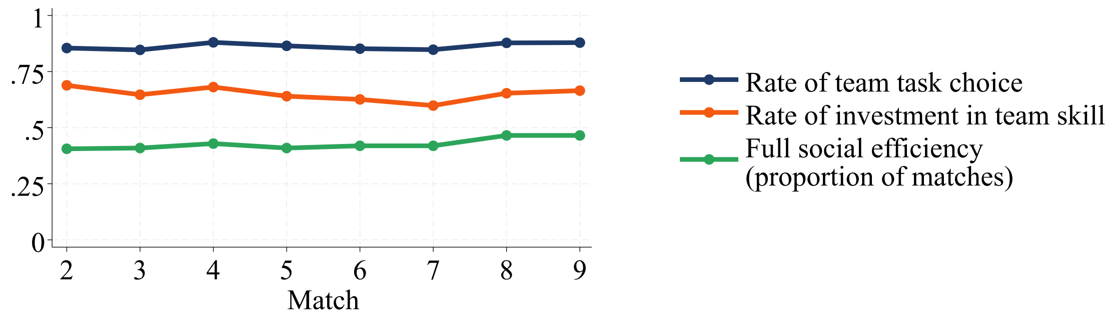


Figure 5: Learning over matches

V.B Effect of b on investment in team skill (Hypothesis 1)

As predicted by Hypothesis 1, the left panel of Figure 4 in Section V.A shows that investment in team skill increases strongly in b. Table 2 confirms that this increase is statistically significant ($p < 0.01$), with each one-unit increment in b increasing the rate of investment by about four percentage points on average.

Furthermore, as predicted by Hypothesis 1a, Table 3 shows that the increase in investment between successive b values is statistically significantly larger in the threshold cases where the team play SPE predicts a change from not investing to investing, compared to adjacent changes in b where the team play SPE does not predict a change in the investment decision ($p < 0.01$). Thus, we find support for predictions motivated by the detailed structure of the team play SPE.

Result 1. *The data support Hypotheses 1 and 1a. Investment in team skill increases strongly in b. Furthermore, the increase is larger in the threshold cases where the team play SPE predicts a change from not investing to investing.*

Table 2: Investment in team skill: effect of b

	Rate of investment	
	(1)	(2)
b	0.042***	0.042***
	(0.001)	(0.001)
Subjects	606	606
Subject-round observations	14,544	14,544
Controls	No	Yes
Mean of dependent variable	0.65	0.65

Notes: (1) reports an OLS regression of an indicator for whether the subject chose to invest in team skill in the round on b, using all subject-round observations. (2) adds fixed-effect controls for session number (1–30), match number (2–9, excluding the unpaid training match), and all the demographics we collected, i.e., gender (male, female, other, prefer not to say) and age group (< 20, ≥ 20, prefer not to say). Heteroskedasticity-consistent standard errors, clustered by session, are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels (two-sided tests).

Table 3: Investment in team skill: team play SPE and effect of b

	Change in investment rate between successive b values	
	(1)	(2)
Average when team play SPE predicts change from not investing to investing	0.191***	0.190***
	(0.018)	(0.018)
Average when team play SPE does not predict change (for cases adjacent to case where change predicted)	0.118***	0.118***
	(0.010)	(0.010)
Difference	0.073***	0.072***
	(0.024)	(0.025)
Subjects	606	606
Subject-round observations	5,810	5,810
Controls	No	Yes

Notes: (1) reports results based on an OLS regression where the dependent variable is an indicator for whether the subject chose to invest in team skill in the round (a full description of the regression is provided in Appendix A.5.1). (2) adds the controls described in the notes to Table 2. Heteroskedasticity-consistent standard errors, clustered by session, are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels (two-sided tests).

V.C Round-to-round changes in investment (Hypothesis 2)

As predicted by Hypothesis 2, the left panel of Figure 4 in Section V.A shows that investment in team skill falls as the rounds progress. In fact, the figure shows that investment falls over rounds for every value of b. The first two columns of Table 4 confirm that this decrease is statistically significant ($p < 0.01$), with the rate of investment falling by about eight percentage points on average from one round to the next. Hypothesis 2 further predicts that the decline from the second to the third round is larger than the decline from the first to the second round. The third and fourth columns of Table 4 provide marginal support for this further prediction: the rate of investment falls by about two percentage points more from the second to the third round, with $p = 0.054$.

Furthermore, as predicted by Hypothesis 2a, Table 5 shows that the decrease in investment from one round to the next is statistically significantly larger in the threshold cases where the team play SPE predicts that investment stops, compared to adjacent round transitions for the same b values where the team play SPE does not predict a change in the investment decision ($p < 0.01$). Thus, as in Section V.B, we find support for predictions motivated by the detailed structure of the team play SPE.

Result 2. *The data support Hypotheses 2 and 2a. Investment in team skill falls as the rounds progress. Furthermore, the decrease is larger in the threshold cases where the team play SPE predicts that investment stops.*

Table 4: Investment in team skill: effect of round

	Round-to-round change in investment rate			
	(1)	(2)	(3)	(4)
Average round-to-round change	-0.083*** (0.005)	-0.083*** (0.005)		
Change from round 1 to round 2			-0.073*** (0.006)	-0.073*** (0.006)
Extra change from round 2 to round 3 compared to round 1 to round 2			-0.019* (0.010)	-0.019* (0.010)
Subjects	606	606	606	606
Subject-round observations	14,544	14,544	14,544	14,544
Controls	No	Yes	No	Yes

Notes: (1) reports an OLS regression of an indicator for whether the subject chose to invest in team skill in the round on a linear round trend, using all subject-round observations. (3) extends (1) by adding an indicator for round 3. (2) and (4) add the controls described in the notes to Table 2. Heteroskedasticity-consistent standard errors, clustered by session, are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels (two-sided tests).

Table 5: Investment in team skill: team play SPE and effect of round

	Round-to-round change in investment rate	
	(1)	(2)
Average when team play SPE predicts that investment stops	-0.156*** (0.012)	-0.156*** (0.012)
Average when team play SPE does not predict that investment stops (for cases adjacent to case where stopping predicted)	-0.067*** (0.009)	-0.067*** (0.009)
Difference	-0.088*** (0.013)	-0.088*** (0.013)
Subjects	601	601
Subject-round observations	7,146	7,146
Controls	No	Yes

Notes: (1) reports results based on an OLS regression where the dependent variable is an indicator for whether the subject chose to invest in team skill in the round (a full description of the regression is provided in Appendix A.5.2). (2) adds the controls described in the notes to Table 2. Heteroskedasticity-consistent standard errors, clustered by session, are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels (two-sided tests).

V.D Theory of mind, cognitive ability, and CAS (Hypothesis 3)

To obtain comparable coefficients in our regressions, we standardize our measures of theory of mind, cognitive ability, and CAS. First, we note the modest but positive correlations between our three individual-level predictors: all pairwise correlations between our measures of theory of mind, cognitive ability, and CAS lie between 0.1 and 0.2.

Consistent with Hypothesis 3, the first two columns of Table 6 show that subjects with higher theory of mind ability are more likely to invest in team skill. In particular, when the team play SPE predicts investment, a one-standard-deviation increase in theory of mind is associated with a two-percentage-point increase in the probability of investment in team skill ($p = 0.015$ with controls).[27] However, the corresponding effect of cognitive ability is smaller and only weakly statistically significant ($p = 0.099$).

Recall that subjects' CAS captures their propensity to coordinate in the Stag Hunt game (as measured in Section 1 of our experiment; see Section III.B). We note that CAS is a behavioral measure, in contrast to skills like theory of mind or cognitive ability. Accordingly, we exclude CAS from the regressions in the first two columns of Table 6, which aim to estimate the total effect of these skills on investment.

Again consistent with Hypothesis 3, the third and fourth columns of Table 6 show that subjects with higher CAS are more likely to invest in team skill. In particular, when the team play SPE predicts investment, a one-standard-deviation increase in CAS is associated with a four-percentage-point increase in the probability of investment in team skill ($p < 0.01$).

The coefficient on CAS in Table 6 captures possible effects of theory of mind and cognitive ability on investment that operate through CAS. Consistent with this, when we include CAS in the regressions, the coefficient on theory of mind decreases slightly (while remaining statistically significant at the 5% level with controls).

When the team play SPE does not predict investment, Table A.2 in Appendix A.1 finds no evidence of any effects of theory of mind, cognitive ability or CAS on investment in team skill (all coefficients are far from statistical significance). This is consistent with the motivation for Hypothesis 3 in Section IV, which suggests that theory of mind, cognitive ability and CAS can help subjects to coordinate on the team play SPE.

[27] These effect sizes are comparable to those in Fe et al. (2022), who find that a one-standard-deviation increase in theory of mind in childhood predicts a two-percentage-point increase in best-responding in a variant of the 11-20 game, as well as a two-percentage-point increase in educational attainment at age 18.

Recall that in the team play SPE, the players always coordinate on the efficient team task. Although Hypothesis 3 focuses on investment in team skill, Table A.3 in Appendix A.1 shows that theory of mind and CAS also predict the likelihood of choosing the team task, with effect sizes similar to those for investment from Table 6.[28]

Result 3. *The data mostly support Hypothesis 3: when the team play SPE predicts investment, subjects with higher theory of mind ability and CAS are more likely to invest in team skill. Furthermore, theory of mind and CAS also predict the likelihood of choosing the team task.*

Table 6: Investment in team skill:
Effects of skills and CAS, when the team play SPE predicts investment

	Rate of investment			
	(1)	(2)	(3)	(4)
Standardized cognitive ability	0.017*	0.014*	0.013	0.012
	(0.009)	(0.008)	(0.009)	(0.008)
Standardized theory of mind	0.019**	0.023**	0.014*	0.018**
	(0.009)	(0.009)	(0.008)	(0.008)
Standardized Coordination Attraction Score			0.043***	0.043***
			(0.013)	(0.014)
Subjects	606	606	606	606
Subject-round observations	8,784	8,784	8,784	8,784
Controls	No	Yes	No	Yes
Mean of dependent variable	0.65	0.65	0.65	0.65

Notes: (1) reports an OLS regression of an indicator for whether the subject chose to invest in team skill in the round on standardized cognitive ability and standardized theory of mind ability (Section III.D describes the measures), using only subject-round observations from pairs of b and round for which the team play SPE predicts investment (see Table 1 in Section IV). We report the mean of the dependent variable using all 14,544 subject-round observations. (3) extends (1) by adding the standardized Coordination Attraction Score (see Equation (2) in Section III.B). (2) and (4) add the controls described in the notes to Table 2. Heteroskedasticity-consistent standard errors, clustered by session, are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels (two-sided tests).

[28]Table A.3 provides only weak evidence of any effect of cognitive ability on the likelihood of choosing the team task; relatedly, Proto et al. (2019) find that cognitive ability does not predict Stag in a repeated Stag Hunt game.

VI Further analyses

VI.A Within-round dynamics

The team play SPE described in Proposition 2 exhibits no within-round dynamics, since task choices are unconditional on the history of play, with the players always coordinating on the socially efficient team task. In Section V, we find support for hypotheses developed based on the predictions of this team play SPE.

Nonetheless, in the presence of strategic uncertainty, within-round dynamics may emerge because investment creates a benefit only when the players coordinate on the team task, and so choosing to invest in team skill potentially signals an intention to also choose the team task (relatedly, Blume et al., 2017, consider forward induction in the Stag Hunt game when players can send costly messages). We note that the other's investment decision can act as an implicit signal, even if it is not deliberately chosen for that purpose.

In this subsection, we aim to establish whether the other's investment decision causally influences a subject's task choice in the same round. Table 7 provides evidence for such a causal effect. From the first two columns, when the other subject in a match-specific pair invests in team skill in a round, a subject is ten percentage points more likely to choose the team task in the same round ($p < 0.01$). The regressions provide causal estimates by using interacted fixed effects for each combination of the subject's own investment decision in the round, the supergame history in previous rounds (for rounds 2 and 3), the value of b, and the match number (two through nine, excluding the unpaid training match).

As described above, the causal effect of the other's investment decision on a subject's task choice is consistent with investment serving as a signal of the other's intent to choose the team task. The data provide evidence against two alternative explanations for the causal effect.

First, the causal effect could be driven by off-equilibrium punishment. In particular, Proposition A.1 in Appendix A.3 describes a SPE in which players punish failure to invest in team skill by choosing the inefficient individual task in the same round. However, if off-equilibrium punishment of the other's unexpected failure to invest in team skill explains some of the causal effect, the magnitude of the causal effect should be larger when the subject herself invested in team skill, and so was on the equilibrium path. Instead, the third and fourth columns of Table 7 show that the causal effect is not statistically significantly stronger when the subject herself invested ($p > 0.10$).[29]

Table 7: Team task choice: within-round effect of the other's investment decision

	Subject chose team task in the round					
	(1)	(2)	(3)	(4)	(5)	(6)
Other chose to invest in the round	0.102***	0.101***	0.080***	0.082***	0.094***	0.093***
	(0.012)	(0.012)	(0.018)	(0.018)	(0.023)	(0.023)
Other chose to invest in the round × Subject chose to invest in the round			0.033	0.029		
			(0.022)	(0.021)		
Other chose to invest in the round × b					0.001	0.001
					(0.002)	(0.002)
Subjects	606	606	606	606	606	606
Subject-round observations	13,035	13,035	13,035	13,035	13,035	13,035
Interacted fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes
Mean of dependent variable	0.86	0.86	0.86	0.86	0.86	0.86

Notes: (1) reports an OLS regression of an indicator for whether the subject chose the team task in the round on an indicator for whether the other subject in the match-specific pair chose to invest in team skill in the round, along with fully interacted fixed effects for each combination of: b; the subject's investment decision in the round; the supergame history (i.e., for rounds 2 and 3, all investment decisions and team task choices in previous rounds of the match, for both subjects in the match-specific pair); and the match number (2–9, excluding the unpaid training match). Following standard practice, we drop subject-round observations that correspond to an interacted fixed effect observed only once, since such observations provide no identifying variation; specifically, we drop 1,509 such observations, leaving 13,035 subject-round observations and 1,180 interacted fixed effects observed more than once. However, we report the mean of the dependent variable using all 14,544 subject-round observations. (3) and (5) extend (1) by interacting the indicator for whether the other subject chose to invest in team skill in the round with, respectively, an indicator for whether the subject herself chose to invest in team skill in the round, and b. (2), (4), and (6) add the controls described in the notes to Table 2, except for the match number that is already included in the interacted fixed effects. Heteroskedasticity-consistent standard errors, clustered by session, are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels (two-sided tests).

Second, the causal effect could reflect the positive effect of the other's investment on the basin of attraction of the team task, which makes choosing the team task less risky (the fourth paragraph of Section III.B introduces basins of attraction, while Table A.1 in Appendix A.1 reports the basins of the team task). However, the effect of investment on the size of the basin of the team task generally increases in b (see Table A.1). Therefore,

[29]We also note that this evidence supports the four detailed bullet points in Appendix A.3 that explain why the requirement for costly off-equilibrium punishment likely makes the SPE described in Proposition A.1 hard to sustain.

if the effect of the other's investment on the basin of the team task explains some of the causal effect, the magnitude of the causal effect should increase in b. Instead, the fifth and sixth columns of Table 7 show that the magnitude of the causal effect is independent of b.

VI.B Deviations from efficiency

As shown in Figure 5 in Section V.A, subjects achieve full social efficiency in a match 43% of the time, with little variation over the eight paid matches. In this section, we analyze the patterns of deviation from the efficient benchmark.

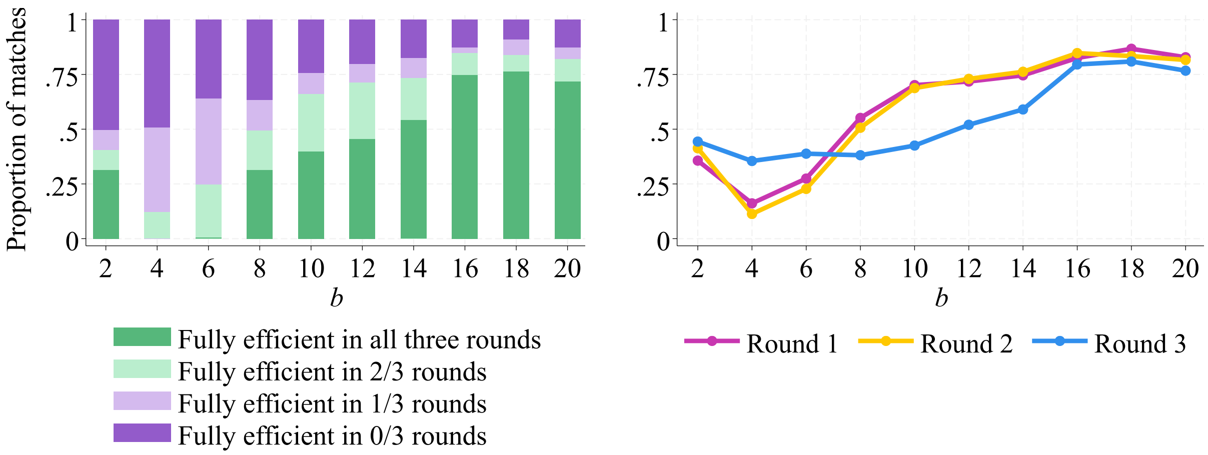
The right panel of Table 1 in Section IV describes the efficient benchmark for investment in team skill in our experiment: for $b \geq 8$ investment is socially efficient in all three rounds, for $b \in \{4, 6\}$ investment is efficient only for the first two rounds, and for $b = 2$ investment is not efficient in any round. These efficiency calculations are conditional on full coordination on the efficient team task in part 2 of every round.

The left panel of Figure 6 describes efficiency at the level of a match between a pair of subjects, splitting matches according to the number of rounds within the match in which choices are fully efficient.[30] Excluding $b = 2$ (where investment is not efficient in any round), the proportion of matches in which choices are fully efficient in all three rounds tends to increase in b. At the same time, the proportion of matches in which choices are not fully efficient in any of the three rounds tends to decline in b.

The right panel of Figure 6 digs deeper by describing efficiency at the level of a round within a match. Again excluding $b = 2$ (where investment is not efficient in any round), the right panel of Figure 6 shows that, in both rounds 1 and 2, the proportion of matches with fully efficient choices tends to increase strongly with b. For $b \geq 4$, it is efficient to invest in team skill in rounds 1 and 2, and so these increases in efficiency are consistent with the increases in investment with b illustrated in the left panel of Figure 4 in Section V.A. For $b \in \{4, 6\}$, the right panel of Figure 6 shows that efficiency is higher in round 3 compared to rounds 1 and 2: investment rates are relatively low at these b values (left panel of Figure 4 in Section V.A), while investment is efficient only in rounds

[30]Throughout this section, we say that choices are fully efficient in a round when all choices in that round (investment decisions and team task choices) follow the efficient benchmark. However, we note that if subjects follow the efficient benchmark by investing in team skill and choosing the team task in one round, but then fail to coordinate on the team task in a later round, the total dynamic benefit of investment in the earlier round might not exceed its cost.

1 and 2. By contrast, for $b \geq 8$, efficiency is lower in round 3 compared to rounds 1 and 2: investment declines over rounds (left panel of Figure 4 in Section V.A), while investment is now efficient in all three rounds.



(a) Efficiency at the match level

(b) Full efficiency at the round level

Figure 6: Rates of social efficiency by b

Finally, Figure 7 describes the types of mistakes that subjects make when they fail to achieve full efficiency in a round. First, at lower b values, subjects frequently fail to coordinate on the efficient team task. When subjects do coordinate on the team task, they also frequently underinvest in team skill, unless b is particularly high (such underinvestment cannot be observed for $b = 2$ where investment is never efficient). Finally, when subjects coordinate on the team task, they sometimes overinvest in team skill, especially for $b = 2$ where investment is not efficient in any round (such overinvestment cannot be observed for $b \geq 8$ where investment is efficient in all rounds).

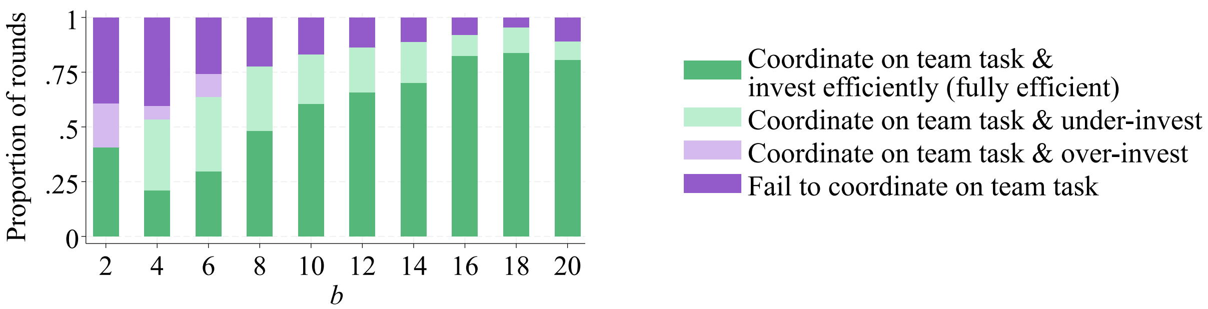


Figure 7: Within-round mistakes by b

VI.C Heterogeneity analysis using machine learning

Finally, we use machine learning to better grasp heterogeneity in our experimental data. Our sample includes 2,424 matches. To better understand heterogeneity in behavior across these matches, we use machine learning to identify clusters of matches where behavior is similar within cluster. Specifically, we use HDBSCAN (Hierarchical Density-Based Spatial Clustering of Applications with Noise; Campello et al., 2015) to identify clusters. HDBSCAN is a popular unsupervised machine learning algorithm that learns the number, size, and shape of clusters directly from the data, which suits our setting where the extent and nature of heterogeneity across matches are unknown in advance.

The HDBSCAN algorithm requires a measure of dissimilarity between pairs of matches: we use the Hamming distance (Hamming, 1950; see, e.g., Andritsos and Tsaparas, 2016, for discussion of clustering using the Hamming distance). Each match is characterized by twelve binary decisions (in each of three rounds, each of two subjects makes an investment decision and task choice). Based on this characterization, the Hamming distance measures the number of differences between two matches in their 12 binary decisions.[31] The algorithm also requires setting a minimum cluster size: we set the minimum cluster size to 3% of the total number of matches, which allows identification of small but meaningful clusters while allowing for noise (that is, matches that cannot be classified into a cluster). With these settings, HDBSCAN identifies seven distinct clusters, leaving 15.2% of matches as noise. We note that lowering the minimum cluster size to allow more clusters to emerge does not substantively affect our results.[32]

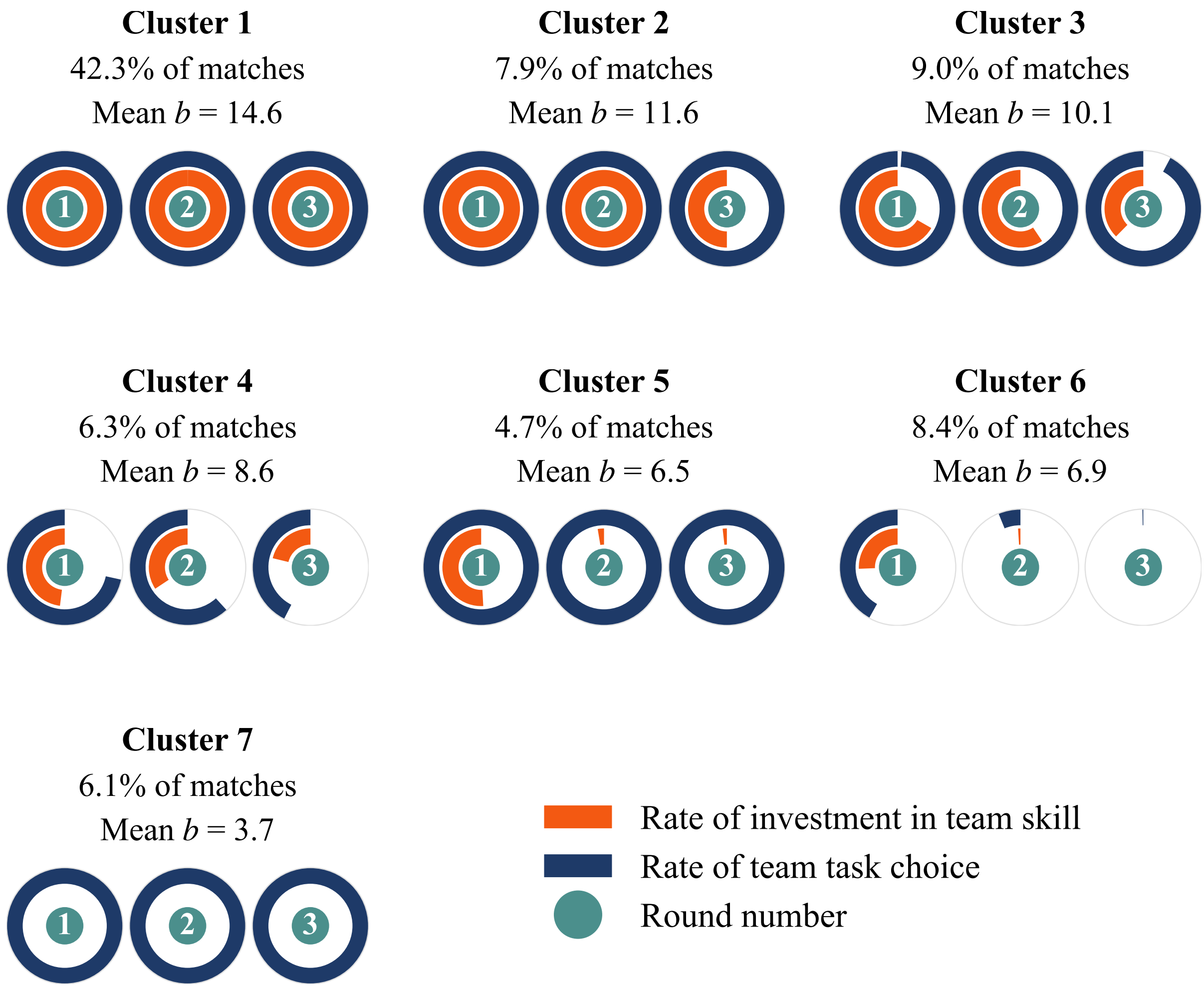
Figure 8 describes the seven clusters. For each cluster, Figure 8 reports the rate of investment in team skill and the rate of team task choice across all matches in the cluster, split by round. Figure 8 also reports the proportion of matches assigned to each cluster and the mean b value across the matches in the cluster (Figure A.1 in Appendix A.1 shows the distribution of b values for each cluster). We number the clusters (from one to seven)

[31] Two technical issues arise when using the Hamming distance. First, the arbitrary ordering of the two subjects in a match can artificially influence the Hamming distance. To correct for this, for each pair of matches we compute Hamming distances for all possible orderings, and then take the minimum. Second, distance ties can cause minor variations in cluster composition that depend on the arbitrary order in which matches are considered: we report results using a single random order, but we have verified that our results vary only slightly across different orders.

[32] With a minimum cluster size of 2.5% of the total number of matches, the number of clusters increases to eight: seven clusters essentially match those in our main specification, with one additional cluster that is very similar to one of the other seven.

in descending order of their rate of investment in team skill (averaged across the three rounds).

First, we note patterns that are common to all clusters. In every cluster, the rate of investment in team skill falls weakly as the rounds progress. The same is true for the rate of team task choice (except for Cluster 3, where the rate is just under 100% in the first round). Finally, in every cluster and every round, the rate of investment in team skill is weakly lower than the rate of team task choice.



Notes: Each cluster is shown with one ring chart per round, with the round number indicated in the center. In each ring chart, the fill proportion of the inner ring indicates the rate of investment in team skill and the fill proportion of the outer ring indicates the rate of team task choice, computed from all subject-round observations in the relevant round for matches in the relevant cluster. Recall that the value of b is constant within a match: the mean b is the mean b value across all matches in the relevant cluster. In the main text we explain how we implemented HDBSCAN; as noted there, 15.2% of matches are not classified into a cluster. We used the standard Python package for HDBSCAN developed by McInnes et al. (2017).

Figure 8: Description of clusters

Second, we focus on the five clusters (1, 2, 3, 5, 7) where the efficient team task is chosen 100% of the time, or close to 100% of the time, in each of the three rounds. Across these five clusters, the rate of investment in team skill falls monotonically with the mean b value (averaging investment across the three rounds, and for each round separately). Across these five clusters, the dynamics of investment in team skill over the three rounds also vary considerably: Cluster 1 exhibits sustained full investment (which is efficient for $b \geq 8$); Cluster 2 exhibits partial breakdown of investment in the final round; Cluster 3 exhibits partial investment from the first round, with a gradual decrease over rounds; Cluster 5 exhibits significant investment only in the first round; and in Cluster 7 investment is completely absent (which is efficient only for $b = 2$).

Third, we focus on the remaining two clusters (4 and 6), which exhibit rates of team task choice well below 100% in every round. These two clusters exhibit partial investment in team skill in the first round, with investment gradually decreasing over rounds in Cluster 4 while falling to close to zero by the second round in Cluster 6. In every round, Cluster 4 exhibits higher rates of investment in team skill and team task choice, compared to Cluster 6 (which has a modestly lower mean b).

Finally, looking at all seven clusters together, we note that low rates of investment in team skill in the final round are foreshadowed by lower investment rates in the first round: the four clusters with rates of investment below 25% in the third round (4, 5, 6, 7) are also the four clusters with the lowest rates of investment in the first round.

VII Conclusion

Although teamwork and collaboration are increasingly important in the modern labor market, the dynamics of teamwork skill formation are not well understood. In this paper we aim to provide the first systematic study of dynamic investment in teamwork skill. First, we construct and analyze a theoretical framework where investment in team skill creates dynamic benefits over time, but where investment is risky because the benefits depend on successful team coordination. Second, we take this framework to the controlled environment of the laboratory to gain insight into the factors that influence investment in team skill.

Consistent with our theoretical predictions, we find under-investment in teamwork skill compared to the socially efficient benchmark. However, we also find that investment in team skill responds strongly to incentives, and hypotheses based on the predictions of our theoretical framework shed light on the pattern of responses to incentives that we observe in our experiment. Building on our theoretically grounded insights and experimental evidence, in future work we hope to study environments where a principal designs incentives strategically to improve investment decisions in teams.

Turning to individual traits, we find that people's theory of mind (that is, the ability to understand the mental states of others) and their propensity to coordinate (measured in a Stag Hunt game with no investment opportunity) predict how much they invest in team skill. These findings highlight that selecting the right people to work in teams according to their observable characteristics facilitates the dynamic development of teamwork skills. Building on these findings, in future work we hope to study teams led by managers who are empowered to choose team members based on their observable characteristics, enabling analysis of endogenous sorting and complementarity effects.

We also hope to extend our analysis to study the effects of team size on dynamic investment in team skill. Increasing the number of team members introduces greater coordination challenges, since the benefits of investing in teamwork skill then depend on achieving successful coordination within a larger group. At the same time, larger teams offer the potential for greater collective gains from investments in team skill.

Finally, we hope to extend our theoretical framework to other real-world settings in which dynamic investments affect payoffs from coordination or cooperation, such as investments that influence the payoff from cooperation in Prisoner's Dilemma or public goods type settings with dominant strategy equilibria.

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Appendix A: Supplemental Appendix

(Intended for Online Publication)

Appendix A.1 Further tables and figures

Table A.1: Basins of attraction of team task,
for various numbers of investments in team skill

	Number of investments in team skill						
b	**0**	**1**	**2**	**3**	**4**	**5**	**6**
2	0.200	0.222	0.243	0.263	0.282	0.300	0.317
4	0.200	0.243	0.282	0.317	0.349	0.378	0.404
6	0.200	0.263	0.317	0.364	0.404	0.440	0.472
8	0.200	0.282	0.349	0.404	0.451	0.491	0.525
10	0.200	0.300	0.378	0.440	0.491	0.533	0.569
12	0.200	0.317	0.404	0.472	0.525	0.569	0.606
14	0.200	0.333	0.429	0.500	0.556	0.600	0.636
16	0.200	0.349	0.451	0.525	0.582	0.627	0.663
18	0.200	0.364	0.472	0.548	0.606	0.650	0.685
20	0.200	0.378	0.491	0.569	0.627	0.671	0.705

Notes: The table reports the size of the basin of attraction of the team task in part 2 of round n, for various numbers of investments in team skill up to that point in the match. The size of the basin is given by $\frac{T_n-I}{T_n-M} = \frac{T_n-73}{T_n-17}$, where T_n (i.e., team skill in part 2 of round n) is defined in Equation (1) in Section II.A, and so the size of the basin in the initial task choice payoff matrix, before any investment, is $\frac{T_0-73}{T_0-17} = \frac{87-73}{87-17} = \frac{1}{5}$. After normalization, our initial task choice payoff matrix is identical to Stag Hunt game payoff matrices used by Cooper et al. (1992), Straub (1995), Clark and Sefton (2001), Clark et al. (2001) and Blume et al. (2017), and Table 3 in Dal Bó et al. (2021) lists further papers that use a basin size of $\frac{1}{5}$.

Table A.2: Investment in team skill:
Effects of skills and CAS, when the team play SPE does not predict investment

	Rate of investment			
	(1)	(2)	(3)	(4)
Standardized cognitive ability	0.010	0.013	0.011	0.013
	(0.013)	(0.012)	(0.013)	(0.012)
Standardized theory of mind	0.004	0.001	0.005	0.002
	(0.009)	(0.010)	(0.009)	(0.009)
Standardized Coordination Attraction Score			-0.010	-0.009
			(0.012)	(0.012)
Subjects	606	606	606	606
Subject-round observations	5,760	5,760	5,760	5,760
Controls	No	Yes	No	Yes
Mean of dependent variable	0.65	0.65	0.65	0.65

Notes: This table reports the same regressions as Table 6, except that the regressions here use only subject-round observations from pairs of b and round for which the team play SPE does not predict investment (see Table 1 in Section IV). Heteroskedasticity-consistent standard errors, clustered by session, are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels (two-sided tests).

Table A.3: Team task choice: effects of skills and CAS

	Rate of team task choice			
	(1)	(2)	(3)	(4)
Standardized cognitive ability	0.019**	0.013*	0.016*	0.012*
	(0.008)	(0.007)	(0.008)	(0.007)
Standardized theory of mind	0.025***	0.023***	0.019***	0.018**
	(0.007)	(0.008)	(0.007)	(0.007)
Standardized Coordination Attraction Score			0.043***	0.041***
			(0.010)	(0.010)
Subjects	606	606	606	606
Subject-round observations	14,544	14,544	14,544	14,544
Controls	No	Yes	No	Yes
Mean of dependent variable	0.86	0.86	0.86	0.86

Notes: This table reports the same regressions as Table 6, except that here (i) the dependent variable is an indicator for whether the subject chose the team task in the round and (ii) the regressions use all subject-round observations. Heteroskedasticity-consistent standard errors, clustered by session, are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels (two-sided tests).

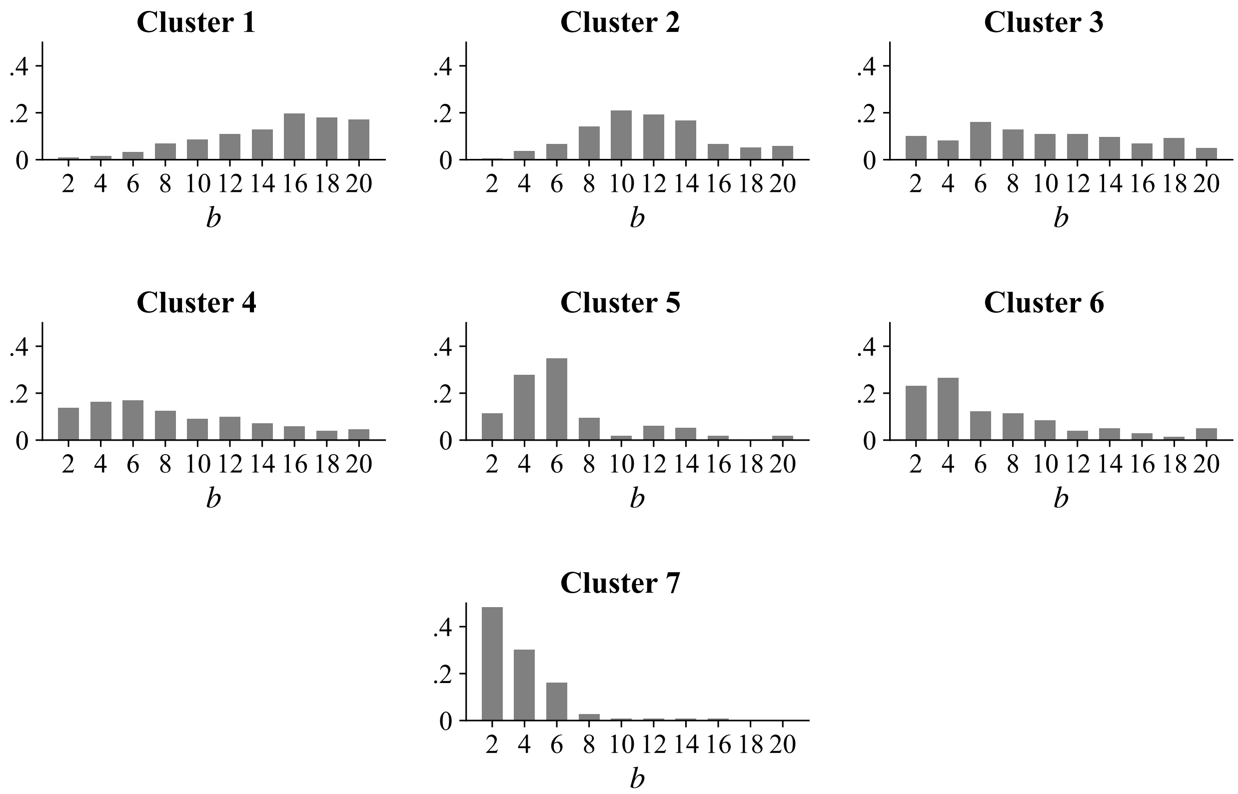


Figure A.1: Distribution of b values for matches in each cluster

Appendix A.2 Further discussion of game structure

Here, we provide further discussion of the structure of the dynamic investment game described in Section II.A.

In our dynamic investment game, players interact for a fixed number of rounds. This setting allows us to study dynamics over rounds as the end of the supergame approaches, and captures real-world settings where team interactions are of finite duration.

In our dynamic investment game, the benefits of investing in team skill do not extend beyond the current supergame. This approach captures well scenarios where team interactions last for a long time, for example small professional partnerships (such as attorneys in partnership who offer complementary legal services), or where the acquired skills are not easily transferable to new contexts. Having said this, we can easily extend the model to include future benefits of investment beyond the current supergame by re-interpreting the investment cost c to be net of any such future benefits. Likewise, c can be re-interpreted to be net of any benefits of investment in other contemporaneous team interactions.

Our dynamic investment game with sequential investment and team task choices allows rich dynamics and captures real-world settings in which investments are directly observable. Mechanisms that facilitate this observability include: formal training (e.g., in communication, conflict resolution, or skills relevant to the specific team setting); and frequent interactions (e.g., in collaborative workspaces or regular meetings) that allow workers to evidence preparation and learning efforts aimed at enhancing performance in the team task. In future work, we hope to consider an alternative theoretical framework that precludes within-round dynamics, in which players make their investment and team task choices simultaneously.

Finally, our dynamic investment game does not include a principal. However, in the presence of a principal who wants to motivate investment in team skill, we can re-intepret b as the portion of the increase in team productivity from investment (when both workers choose the team task) that the principal passes back to each worker as a performance incentive. In that case, the principal can vary b by varying the size of this performance incentive.

Appendix A.3 Within-round conditional task choices

The equilibrium analysis in Sections II.C.1 and II.C.2 considered only SPE in which task choices are unconditional on the history of play. Here, we extend the analysis to SPE in which the players condition task choices on investment decisions, in particular choosing the team task in part 2 of a round iff both players invested in team skill in part 1 of the same round. One interpretation of such within-round conditional play is that the players punish failure to invest in team skill by choosing the inefficient individual task.

We will focus on the case where this type of within-round conditional play can be sustained in equilibrium. Throughout, we have assumed that $T_0 - I > 0$ (see Section II.A). Here, we further assume that $T_0 - I > c - 2b$, which always holds in our experiment (see Section III.C).[33] Under that assumption, within-round conditional play allows a SPE with fully efficient task choices and investment decisions.

Proposition A.1. *There exists a SPE in which, on the equilibrium path, the players always choose the team task, and invest in team skill for the socially efficient number of rounds. In this SPE, in rounds where investment is socially efficient, the players condition their task choices on investment decisions in the same round, choosing the team task iff both players invested in team skill.*

Proof. Recall from Remark 2 that investment in team skill is efficient iff the number of remaining rounds $k \geq \frac{c}{2b}$. Starting from the beginning of the supergame, or after any history of play over some rounds, suppose that the players use the following strategy: (i) in rounds where investment is efficient, invest in team skill in part 1 of that round unconditionally, and choose the team task in part 2 of that round iff both players invested in team skill in part 1 of the same round; and (ii) starting from the first round where investment is not efficient (if such a round exists), do not invest in team skill and choose the team task, both unconditionally on the history of play.

In rounds where investment is efficient, following the other player's conditional task choice rule is clearly optimal (to receive $T_n > I$ or $I > M$, and noting that behavior in round n has no effect on behavior in any future rounds). The within-round cost of deviating to not investing is $2b + T_{n-1} - I$, while the within-round benefit is c. The within-round cost exceeds the benefit since $T_{n-1} \geq T_0$, and by assumption in this section

[33] A sufficient condition is that $T_0 - I \geq c$. Otherwise, by making the assumption, we exclude cases where b is very low (specifically, where $b \leq \frac{c}{2} - \frac{(T_0 - I)}{2}$).

$2b + T_0 - I > c$. Furthermore, the across-round cost of deviating is weakly positive due to losing the benefit of one's own current investment in any future rounds (and there is no across-round benefit).

From the first round where investment is not efficient, the strategies are best responses from Proposition 2, recalling that in the SPE from Proposition 2 the players never invest when inefficient. □

Although Proposition A.1 constructs a socially efficient SPE using within-round conditional play, this SPE requires coordination on the inefficient individual task off the equilibrium path, and thus is likely harder to sustain, compared to the team play SPE with unconditional play of the efficient team task (from Proposition 2):

- The SPE from Proposition A.1 requires coordination on the inefficient individual task off the equilibrium path, immediately after a player fails to invest in team skill in a round where investment is socially efficient. This off-equilibrium "punishment" must be expected to occur: (i) even though coordination on the efficient team task would increase payoffs in the current round; (ii) even if the players have a long history of successfully coordinating on the efficient team task; and (iii) even after a long history of previous investments in team skill that increase the current-round cost of the off-equilibrium punishment.

- Consider specifically the final round in which investment in team skill is socially efficient. On the equilibrium path of the SPE from Proposition A.1, the players invest in team skill in this round, but not in any future rounds. After a deviation to not investing, the costly off-equilibrium punishment appears particularly hard to sustain in this case, because there is no need to maintain the credibility of punishments for future rounds (in future rounds, the players do not invest and choose the team task unconditionally, and so the SPE does not rely on off-equilibrium punishments).

- Furthermore, in rounds where investment in team skill is socially efficient, but the players do not invest when they expect that the team task will be chosen unconditionally (see Proposition 2), not investing in team skill is consistent with the team play SPE from Proposition 2, but inconsistent with the SPE from Proposition A.1. Consequently, a failure to invest in team skill has the potential to coordinate expectations onto the team play SPE from Proposition 2, which avoids the costly off-equilibrium punishment. This reasoning is particularly compelling in the final round in which investment is socially efficient, since the SPE from Propositions 2 and A.1 coincide in any future rounds.

- In a simpler setting where subjects first play a finitely repeated Prisoner's Dilemma game and then play the Stag Hunt game a single time (with a fixed payoff matrix, so the game is not dynamic), Fréchette and Yuksel (2017) conclude that subjects are generally not able to use conditional play in the Stag Hunt game to increase cooperation in the Prisoner's Dilemma game, even though such behavior can be sustained as a SPE.

We further note that within-round conditional play can be counter-productive by leading to socially inefficient *over-investment* in team skill. In particular, suppose that $c > 2b$, so that it is not socially efficient to invest in all rounds (see Remark 2). Nonetheless, there is a SPE in which, on the equilibrium path, the players always invest in team skill. In this SPE, the players always make their task choice conditional, choosing the team task in part 2 of a round iff both players invested in team skill in part 1 of the same round.[34] In rounds where investment in team skill is not socially efficient, the anticipated loss from inefficiently coordinating on the individual task after a failure to invest forces the players to over-invest.

[34]The proof follows from that of Proposition A.1, but where now the players follow the conditional rule (i) in all rounds instead of only in rounds in which investment is socially efficient.

Appendix A.4 Contextualized framing

Given the applied nature of our research questions, we chose to use contextualized framing in the experiment: in each round, subjects first chose whether to "invest in team skill," and then selected either the "team task" or "individual task." We judge that this framing helped subjects better understand the structure of our somewhat complex dynamic investment game. Moreover, invoking context likely encouraged subjects to draw on relevant real-world experience. Similarly, Brandts and Cooper (2006) use contextualized framing when studying how incentives shape coordination in organizations.

Appendix A.5 Further details on empirical analysis

Appendix A.5.1 Table 3

This appendix describes the analysis underlying the results in Table 3. As context for this discussion, recall from Table 1 in Section IV that the team play SPE predicts that the investment decision changes from not investing to investing in round 1 when b changes from 4 to 6, in round 2 when b changes from 6 to 8, and in round 3 when b changes from 14 to 16.

Column (1) of Table 3 reports results from an OLS regression that estimates changes in the investment rate between successive b values for: (i) cases where the team play SPE predicts that the investment decision changes from not investing to investing (i.e., in round 1, between $b = 4$ and 6; in round 2, between $b = 6$ and 8; and in round 3, between $b = 14$ and 16); and (ii) adjacent cases (where the SPE does not predict a change in the investment decision, i.e., in round 1, between $b = 2$ and 4, and between $b = 6$ and 8; in round 2, between $b = 4$ and 6, and between $b = 8$ and 10; and in round 3, between $b = 12$ and 14, and between $b = 16$ and 18). The estimation sample includes only subject-round observations corresponding to these cases, i.e., observations from round 1 with $b \in \{2, 4, 6, 8\}$; round 2 with $b \in \{4, 6, 8, 10\}$; and round 3 with $b \in \{12, 14, 16, 18\}$.

Specifically, we run an OLS regression of an indicator for whether the subject chose to invest in team skill in the round on: a fixed effect for round 1 interacted with indicators for $b \geq 4$, $b \geq 6$, and $b \geq 8$; a fixed effect for round 2 interacted with indicators for $b \geq 6$, $b \geq 8$, and $b \geq 10$; and a fixed effect for round 3 interacted with indicators for $b \geq 14$, $b \geq 16$, and $b = 18$. The regression also includes non-interacted round fixed effects, which capture the investment rate for the lowest b value in the estimation sample in each round, i.e., for $b = 2$ in round 1, for $b = 4$ in round 2, and for $b = 12$ in round 3.

Three of the estimated coefficients capture changes in the investment rate between successive b values for cases where the team play SPE predicts a change from not investing to investing. Specifically: the coefficient on the fixed effect for round 1 interacted with the indicator for $b \geq 6$, which captures the change between $b = 4$ and 6 in round 1; the coefficient on the fixed effect for round 2 interacted with the indicator for $b \geq 8$, which captures the change between $b = 6$ and 8 in round 2; and the coefficient on the fixed effect for round 3 interacted with the indicator for $b \geq 16$, which captures the change between $b = 14$ and 16 in round 3. We report the average of these estimates in the first row of

Table 3.

Six additional estimated coefficients capture changes in the investment rate between successive b values for adjacent cases (where the SPE does not predict a change in the investment decision). Specifically: the coefficients on the fixed effect for round 1 interacted with the indicators for $b \geq 4$ and $b \geq 8$, which capture the changes between $b = 2$ and 4, and between $b = 6$ and 8, respectively; the coefficients on the fixed effect for round 2 interacted with the indicators for $b \geq 6$ and $b \geq 10$, which capture the changes between $b = 4$ and 6, and between $b = 8$ and 10, respectively; and the coefficients on the fixed effect for round 3 interacted with the indicators for $b \geq 14$ and $b = 18$, which capture the changes between $b = 12$ and 14, and between $b = 16$ and 18, respectively. We report the average of these estimates in the second row of Table 3.

We compute the standard errors reported in Table 3 using the delta method, based on the estimated variance–covariance matrix from the regression.

Appendix A.5.2 Table 5

This appendix describes the analysis underlying the results in Table 5. As context for this discussion, recall from Table 1 in Section IV that the team play SPE predicts that investment stops between rounds 1 and 2 for $b = 6$, and between rounds 2 and 3 for $b \in \{8, 10, 12, 14\}$.

Column (1) of Table 5 reports results from an OLS regression that estimates round-to-round changes in the investment rate for: (i) cases where the team play SPE predicts that investment stops (i.e., between rounds 1 and 2 for $b = 6$, and between rounds 2 and 3 for $b \in \{8, 10, 12, 14\}$); and (ii) adjacent cases (where the SPE does not predict a change in the investment decision, i.e., between rounds 2 and 3 for $b = 6$, and between rounds 1 and 2 for $b \in \{8, 10, 12, 14\}$). The estimation sample includes only subject-round observations corresponding to these cases, i.e., only subject-round observations with $b \in \{6, 8, 10, 12, 14\}$.

Specifically, we run an OLS regression of an indicator for whether the subject chose to invest in team skill in the round on fixed effects for each $b \in \{6, 8, 10, 12, 14\}$, each interacted with indicators for round ≥ 2 and round $= 3$. The regression also includes non-interacted fixed effects for each $b \in \{6, 8, 10, 12, 14\}$, which capture the investment rate in round 1 for each of those b values.

Five of the estimated coefficients capture round-to-round changes in the investment rate for cases where the team play SPE predicts that investment stops. Specifically: the coefficient on the fixed effect for $b = 6$ interacted with the indicator for round ≥ 2, which captures the change between rounds 1 and 2 for $b = 6$; and the coefficients on the fixed effects for each $b \in \{8, 10, 12, 14\}$ interacted with the indicator for round $= 3$, which capture the change between rounds 2 and 3 for each of those b values. We report the average of these estimates in the first row of Table 5.

Five additional estimated coefficients capture round-to-round changes in the investment rate for adjacent cases (where the SPE does not predict a change in the investment decision). Specifically: the coefficient on the fixed effect for $b = 6$ interacted with the indicator for round $= 3$, which captures the change between rounds 2 and 3 for $b = 6$; and the coefficients on the fixed effects for each $b \in \{8, 10, 12, 14\}$ interacted with the indicator for round ≥ 2, which capture the change between rounds 1 and 2 for each of those b values. We report the average of these estimates in the second row of Table 5.

We compute the standard errors reported in Table 5 using the delta method, based on the estimated variance–covariance matrix from the regression.

Appendix B:
Experimental Screenshots

(Intended for Online Publication)

Overview of this session **Time remaining on this screen (seconds): 36**

This session is made up of 3 sections.

In Sections 1 and 2, you will participate in economic interactions.

In Section 3, you will be asked to complete two tests and a short questionnaire.

The instructions begin on the next screen. Throughout the session, all participants will be given exactly the same instructions, and we will not deceive you in any way.

Please raise your hand if you have any questions.

We will move to the next screen when the timer above reaches 0.

Note: This screen was displayed for 40 seconds.

Section 1: Instructions **Time remaining on this screen (seconds): 95**

Section 1 of this session is made up of 7 encounters.

At the start of each encounter, you will be randomly paired with another participant in this room.

In each encounter, you will choose X or Y. The participant you are paired with will also choose X or Y.

In each encounter, a payoff table will show the payoffs (in points) from the encounter for the four possible pairs of choices. These payoff tables will look like the table below, but with the question marks replaced by specific numbers.

Your choice:	X	X	Y	Y
Other's choice:	X	Y	X	Y
Your payoff (points):	?	?	?	?
Other's payoff (points):	?	?	?	?

Your total points at the end of the session depend on your choice and the other's choice in each encounter, but you will not be told the other's choice.

Value of points: at the end of the session, your total points will be converted into cash at the exchange rate of 125 points = 1 dollar.

Please raise your hand if you have any questions.

We will move to the next screen when the timer above reaches 0.

Note: This screen was displayed for 100 seconds.

Section 1: Encounter 3 of 7 **Time remaining to make your decision (seconds): 25**

For this encounter, you have been randomly paired with another participant in this room.

Your choice:	X	X	Y	Y
Other's choice:	X	Y	X	Y
Your payoff (points):	70	10	20	20
Other's payoff (points):	70	20	10	20

Make your choice for this encounter:

X Y

Note: This screen was displayed for 30 seconds (see footnote 17).

Section 2 of this session is made up of 9 matches.

At the start of each match, you will be randomly paired with another participant in this room. You will be paired with this participant until the end of the match. Each match will last 3 rounds.

In each round of a match, you will choose the team task or the individual task. The participant you are paired with for the match will also choose the team task or the individual task. The payoff table below shows the payoffs (in points) for the four possible pairs of choices.

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	T (team skill)	17	73	73
Other's payoff (points):	T (team skill)	73	17	73

In each match, the starting level of team skill will be T = 87.

In each round of a match, before you choose the team task or the individual task, you will choose whether or not to invest in team skill. The participant you are paired with for the match will also choose whether or not to invest in team skill.

Investing in team skill has a cost and a benefit:

- Cost: each time you invest in team skill, you will pay a cost of 15 points.
- Benefit: each time you invest in team skill, you will increase T (the level of team skill) by B units for the rest of the match (that is, for the current round **and** all remaining rounds of the match).
- In each match, B will be a specific number chosen randomly at the start of the match, and B will stay the same until the end of the match.

Value of points: at the end of the session, your total points will be converted into cash at the exchange rate of 125 points = 1 dollar.

Please raise your hand if you have any questions.

We will move to the next screen when the timer above reaches 0.

Note: This screen was displayed for 120 seconds.

Section 2: Match 1 of 9	In this match, each investment in team skill increases team skill by 10	Time remaining on this screen (seconds): 46
Welcome to Match 1	The current level of team skill is 87	

This is the training match. You will not be paid for this match.

That is, your points from Match 1 will not be converted into cash. Instead, Match 1 is an opportunity to explore how matches work without any consequences for your cash payment at the end of the session.

For this match, you have been randomly paired with another participant in this room. You will be paired with this participant until the end of the match, which will last 3 rounds.

In each round of this match, you will choose the team task or the individual task. The participant you are paired with for this match will also choose the team task or the individual task. The payoff table below shows the payoffs (in points) for the four possible pairs of choices.

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	T (team skill)	17	73	73
Other's payoff (points):	T (team skill)	73	17	73

In this match, the starting level of team skill will be T = 87.

In this match, each time you invest in team skill:

- You will pay a cost of 15 points.
- You will increase T (the level of team skill) by 10 units for the rest of the match (that is, for the current round **and** all remaining rounds of the match).

We will move to the next screen when the timer above reaches 0.

Note: This screen was displayed for 50 seconds.

Section 2: Match 2 of 9	In this match, each investment in team skill increases team skill by 8	Time remaining on this screen (seconds): 44
Welcome to Match 2	The current level of team skill is 87	

This is a paid match. You will be paid for your points from all rounds of this match.

Value of points: at the end of the session, your total points will be converted into cash at the exchange rate of 125 points = 1 dollar.

For this match, you have been randomly paired with another participant in this room. You will be paired with this participant until the end of the match, which will last 3 rounds.

In each round of this match, you will choose the team task or the individual task. The participant you are paired with for this match will also choose the team task or the individual task. The payoff table below shows the payoffs (in points) for the four possible pairs of choices.

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	T (team skill)	17	73	73
Other's payoff (points):	T (team skill)	73	17	73

In this match, the starting level of team skill will be T = 87.

In this match, each time you invest in team skill:

- You will pay a cost of 15 points.
- You will increase T (the level of team skill) by 8 units for the rest of the match (that is, for the current round **and** all remaining rounds of the match).

We will move to the next screen when the timer above reaches 0.

Note: This screen was displayed for 50 seconds.

Section 2: Match 2 of 9 | **In this match, each investment in team skill increases team skill by 8** | **Time remaining to make your decision (seconds): 14**

Round 1 of 3: Part 1 | **The current level of team skill is 87**

The current level of team skill is 87.

If you invest in team skill in this round:

- You will pay a cost of 15 points.
- You will increase the level of team skill by 8 for the rest of this match.

Make your investment choice for this round:

Invest in team skill | Do not invest in team skill

Note: This screen was displayed for 20 seconds (see footnote 17).

Section 2: Match 2 of 9	In this match, each investment in team skill increases team skill by 8	Time remaining to make your decision (seconds): 20
Round 1 of 3: Part 2	The current level of team skill is 103	

Feedback on Part 1 of this round

In Part 1 of this round:

- You chose to invest in team skill.
- The participant you are paired with for this match chose to invest in team skill.

Since 2 investments were made in Part 1 of this round, the level of team skill has increased by 16.
Therefore, the current level of team skill is 103.

Task choice for this round

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	103	17	73	73
Other's payoff (points):	103	73	17	73

Make your task choice for this round:

Team task   Individual task

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 2 of 9	In this match, each investment in team skill increases team skill by 8	Time remaining on this screen (seconds): 20
Round 1 of 3: End of the round	The current level of team skill is 103	

Feedback on choices and payoffs in this round

	You	Other
Investment choice in Part 1:	Invested in team skill	Invested in team skill
Investment cost paid in Part 1 (points):	15	15
Task choice in Part 2:	Team task	Team task
Payoff in Part 2 (points):	103	103
Total payoff in this round (points):	**88**	**88**

This is the end of round 1 of this match.

The next round of this match will start with the current level of team skill, which is 103.

We will move to the next round of this match when the timer above reaches 0.

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 2 of 9 | **In this match, each investment in team skill increases team skill by 8** | **Time remaining to make your decision (seconds): 13**

Round 2 of 3: Part 1 | **The current level of team skill is 103**

The current level of team skill is 103.

If you invest in team skill in this round:

- You will pay a cost of 15 points.
- You will increase the level of team skill by 8 for the rest of this match.

Make your investment choice for this round:

Invest in team skill | Do not invest in team skill

Note: This screen was displayed for 20 seconds (see footnote 17).

Section 2: Match 2 of 9	In this match, each investment in team skill increases team skill by 8	Time remaining to make your decision (seconds): 17
Round 2 of 3: Part 2	The current level of team skill is 111	

Feedback on Part 1 of this round

In Part 1 of this round:

- You chose to invest in team skill.
- The participant you are paired with for this match chose to not invest in team skill.

Since 1 investment was made in Part 1 of this round, the level of team skill has increased by 8.
Therefore, the current level of team skill is 111.

Task choice for this round

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	111	17	73	73
Other's payoff (points):	111	73	17	73

Make your task choice for this round:

Team task | Individual task

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 2 of 9	In this match, each investment in team skill increases team skill by 8	Time remaining on this screen (seconds): 14
Round 2 of 3: End of the round	The current level of team skill is 111	

Feedback on choices and payoffs in this round

	You	Other
Investment choice in Part 1:	Invested in team skill	Did not invest in team skill
Investment cost paid in Part 1 (points):	15	0
Task choice in Part 2:	Team task	Team task
Payoff in Part 2 (points):	111	111
Total payoff in this round (points):	**96**	**111**

This is the end of round 2 of this match.

The next round of this match will start with the current level of team skill, which is 111.

We will move to the next round of this match when the timer above reaches 0.

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 2 of 9	In this match, each investment in team skill increases team skill by 8	Time remaining to make your decision (seconds): 12
Round 3 of 3: Part 1	The current level of team skill is 111	

The current level of team skill is 111.

If you invest in team skill in this round:

- You will pay a cost of 15 points.
- You will increase the level of team skill by 8 for the rest of this match.

Make your investment choice for this round:

Invest in team skill | Do not invest in team skill

Note: This screen was displayed for 20 seconds (see footnote 17).

Section 2: Match 2 of 9	In this match, each investment in team skill increases team skill by 8	Time remaining to make your decision (seconds): 17
Round 3 of 3: Part 2	The current level of team skill is 111	

Feedback on Part 1 of this round

In Part 1 of this round:

- You chose to not invest in team skill.
- The participant you are paired with for this match chose to not invest in team skill.

Since 0 investments were made in Part 1 of this round, the level of team skill has not changed.
Therefore, the current level of team skill is 111.

Task choice for this round

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	111	17	73	73
Other's payoff (points):	111	73	17	73

Make your task choice for this round:

Team task | Individual task

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 2 of 9	In this match, each investment in team skill increases team skill by 8	Time remaining on this screen (seconds): 14
Round 3 of 3: End of the round	**The current level of team skill is 111**	

Feedback on choices and payoffs in this round

	You	Other
Investment choice in Part 1:	Did not invest in team skill	Did not invest in team skill
Investment cost paid in Part 1 (points):	0	0
Task choice in Part 2:	Team task	Team task
Payoff in Part 2 (points):	111	111
Total payoff in this round (points):	**111**	**111**

This is the end of this match.

We will move to the next match when the timer above reaches 0.

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 5 of 9	In this match, each investment in team skill increases team skill by 16	Time remaining on this screen (seconds): 43
Welcome to Match 5	The current level of team skill is 87	

This is a paid match. You will be paid for your points from all rounds of this match.
Value of points: at the end of the session, your total points will be converted into cash at the exchange rate of 125 points = 1 dollar.

For this match, you have been randomly paired with another participant in this room. You will be paired with this participant until the end of the match, which will last 3 rounds.

In each round of this match, you will choose the team task or the individual task. The participant you are paired with for this match will also choose the team task or the individual task. The payoff table below shows the payoffs (in points) for the four possible pairs of choices.

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	T (team skill)	17	73	73
Other's payoff (points):	T (team skill)	73	17	73

In this match, the starting level of team skill will be T = 87.

In this match, each time you invest in team skill:
- You will pay a cost of 15 points.
- You will increase T (the level of team skill) by 16 units for the rest of the match (that is, for the current round **and** all remaining rounds of the match).

We will move to the next screen when the timer above reaches 0.

Note: This screen was displayed for 50 seconds.

Section 2: Match 5 of 9 | **In this match, each investment in team skill increases team skill by 16** | **Time remaining to make your decision (seconds): 13**

Round 1 of 3: Part 1 | **The current level of team skill is 87**

The current level of team skill is 87.

If you invest in team skill in this round:

- You will pay a cost of 15 points.
- You will increase the level of team skill by 16 for the rest of this match.

Make your investment choice for this round:

Invest in team skill | Do not invest in team skill

Note: This screen was displayed for 20 seconds (see footnote 17).

Section 2: Match 5 of 9	In this match, each investment in team skill increases team skill by 16	Time remaining to make your decision (seconds): 17
Round 1 of 3: Part 2	The current level of team skill is 119	

Feedback on Part 1 of this round

In Part 1 of this round:

- You chose to invest in team skill.
- The participant you are paired with for this match chose to invest in team skill.

Since 2 investments were made in Part 1 of this round, the level of team skill has increased by 32.
Therefore, the current level of team skill is 119.

Task choice for this round

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	119	17	73	73
Other's payoff (points):	119	73	17	73

Make your task choice for this round:

Team task | Individual task

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 5 of 9	In this match, each investment in team skill increases team skill by 16	Time remaining on this screen (seconds): 19
Round 1 of 3: End of the round	The current level of team skill is 119	

Feedback on choices and payoffs in this round

	You	**Other**
Investment choice in Part 1:	Invested in team skill	Invested in team skill
Investment cost paid in Part 1 (points):	15	15
Task choice in Part 2:	Individual task	Individual task
Payoff in Part 2 (points):	73	73
Total payoff in this round (points):	**58**	**58**

This is the end of round 1 of this match.

The next round of this match will start with the current level of team skill, which is 119.

We will move to the next round of this match when the timer above reaches 0.

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 5 of 9 | **In this match, each investment in team skill increases team skill by 16** | **Time remaining to make your decision (seconds): 6**

Round 2 of 3: Part 1 | **The current level of team skill is 119**

The current level of team skill is 119.

If you invest in team skill in this round:

- You will pay a cost of 15 points.
- You will increase the level of team skill by 16 for the rest of this match.

Make your investment choice for this round:

[Invest in team skill] [Do not invest in team skill]

Note: This screen was displayed for 20 seconds (see footnote 17).

Section 2: Match 5 of 9	In this match, each investment in team skill increases team skill by 16	Time remaining to make your decision (seconds): 15
Round 2 of 3: Part 2	The current level of team skill is 151	

Feedback on Part 1 of this round

In Part 1 of this round:

- You chose to invest in team skill.
- The participant you are paired with for this match chose to invest in team skill.

Since 2 investments were made in Part 1 of this round, the level of team skill has increased by 32.
Therefore, the current level of team skill is 151.

Task choice for this round

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	151	17	73	73
Other's payoff (points):	151	73	17	73

Make your task choice for this round:

Team task | Individual task

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 5 of 9	In this match, each investment in team skill increases team skill by 16	Time remaining on this screen (seconds): 20
Round 2 of 3: End of the round	The current level of team skill is 151	

Feedback on choices and payoffs in this round

	You	Other
Investment choice in Part 1:	Invested in team skill	Invested in team skill
Investment cost paid in Part 1 (points):	15	15
Task choice in Part 2:	Team task	Individual task
Payoff in Part 2 (points):	17	73
Total payoff in this round (points):	**2**	**58**

This is the end of round 2 of this match.

The next round of this match will start with the current level of team skill, which is 151.

We will move to the next round of this match when the timer above reaches 0.

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 5 of 9	In this match, each investment in team skill increases team skill by 16	Time remaining to make your decision (seconds): 15
Round 3 of 3: Part 1	The current level of team skill is 151	

The current level of team skill is 151.

If you invest in team skill in this round:

- You will pay a cost of 15 points.
- You will increase the level of team skill by 16 for the rest of this match.

Make your investment choice for this round:

[Invest in team skill] [Do not invest in team skill]

Note: This screen was displayed for 20 seconds (see footnote 17).

Section 2: Match 5 of 9	In this match, each investment in team skill increases team skill by 16	Time remaining to make your decision (seconds): 17
Round 3 of 3: Part 2	The current level of team skill is 183	

Feedback on Part 1 of this round

In Part 1 of this round:

- You chose to invest in team skill.
- The participant you are paired with for this match chose to invest in team skill.

Since 2 investments were made in Part 1 of this round, the level of team skill has increased by 32.
Therefore, the current level of team skill is 183.

Task choice for this round

Your choice:	Team task	Team task	Individual task	Individual task
Other's choice:	Team task	Individual task	Team task	Individual task
Your payoff (points):	183	17	73	73
Other's payoff (points):	183	73	17	73

Make your task choice for this round:

Team task | Individual task

Note: This screen was displayed for 25 seconds (see footnote 17).

Section 2: Match 5 of 9	In this match, each investment in team skill increases team skill by 16	Time remaining on this screen (seconds): 19
Round 3 of 3: End of the round	The current level of team skill is 183	

Feedback on choices and payoffs in this round

	You	Other
Investment choice in Part 1:	Invested in team skill	Invested in team skill
Investment cost paid in Part 1 (points):	15	15
Task choice in Part 2:	Team task	Team task
Payoff in Part 2 (points):	183	183
Total payoff in this round (points):	**168**	**168**

This is the end of this match.

We will move to the next match when the timer above reaches 0.

Note: This screen was displayed for 25 seconds (see footnote 17).

Test 1: Instructions **Time remaining on this screen (seconds): 31**

Test 1 is made up of 11 questions.

For every question, there is a pattern with a piece missing and 6 pieces below the pattern. You have to choose which of the pieces below is the right one to complete the pattern. In every case, one and only one of these pieces is the right one to complete the pattern.

You will have 10 minutes to complete the test.

You will be paid $2 for completing this test, irrespective of your answers.

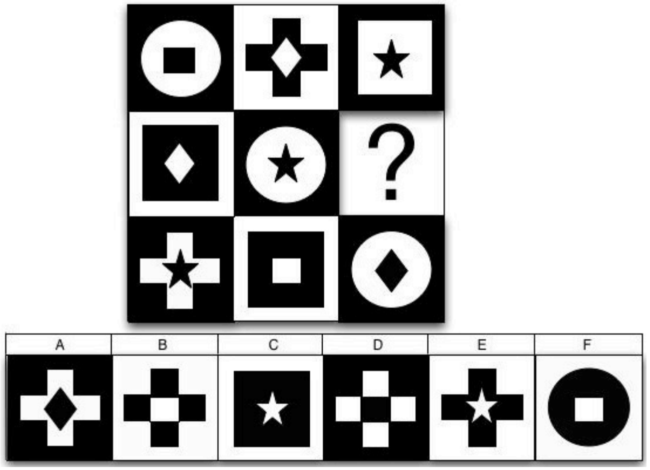
We will move to the next screen when the timer above reaches 0.

Note: This screen was displayed for 35 seconds.

Question 5 of 11

Please enter your answer to this question in the column to the right of the pattern.

You can move back and forth between the 11 questions in this test using the green buttons and you can change your previous answers.



Please enter your answer to this question in this column:

- A
- B
- C
- D
- E
- F

Previous Next

Test 2: Instructions **Time remaining on this screen (seconds): 42**

Test 2 is made up of 36 questions.

For every question, you will see a set of eyes surrounded by 4 words.

For each set of eyes, choose and click on which word best describes what the person in the picture is thinking or feeling.

You may feel that more than one word is applicable but please choose just one word, the word which you consider to be most suitable.

Before making your choice, make sure that you have read all 4 words. You should try to do the task as quickly as possible.

If you really don't know what a word means you can look it up in the **definition handout**, which is provided in the materials on your desk.

You will have 10 minutes to complete the test.

You will be paid $2 for completing this test, irrespective of your answers.

We will move to the next screen when the timer above reaches 0.

Note: This screen was displayed for 45 seconds.

Question 14 of 36

Please click on which word best describes what the person in the picture is thinking or feeling.

You can move back and forth between the 36 questions in this test using the green buttons and you can change your previous answers.

irritated

disappointed

depressed

accusing

Previous Next

Questionnaire

Finally, please answer two short questions about yourself.

What is your gender?

- ◯ **Male**
- ◯ **Female**
- ◯ **Other**
- ◯ **Prefer not to say**

Next

Questionnaire

What is your age group?

- ◯ **Under 20 years**
- ◯ **20 years or older**
- ◯ **Prefer not to say**

Next