

# Dominated Contract in Team Production

Simin He and Bin Miao\*

Jan 2026

**Abstract:** We experimentally investigate the effect of a dominated contract in team production, one that punishes low output without rewarding high output. We consider three systems of implementing the dominated contract: exogenous, voting, and leadership. We find that teams often voluntarily opt for the dominated contract in the latter two systems. Moreover, once implemented, the dominated contract is equally effective in improving efforts across all three systems. Finally, we identify a negative information effect in endogenous institutions: the disclosure of information about others' contract choices may backfire and undermine efficiency.

**Keywords:** dominated contract, cooperation, coordination, endogenous institutions, laboratory experiment.

**JEL codes:** C72, C91, C92

---

\* Simin He: School of Economics, Shanghai University of Finance and Economics, 111 Wuchuan Rd, 200433 Shanghai, China, [he.simin@mail.shufe.edu.cn](mailto:he.simin@mail.shufe.edu.cn). Bin Miao: School of Economics, Renmin University of China, 59 Zhongguancun Street, 100872 Beijing, China, [binmiao11@gmail.com](mailto:binmiao11@gmail.com). We are very grateful to Xun Zhu who helped programming the experiments, and Fan Huang and Jialiang Yu who helped running the experiments. This paper benefited from comments by participants of the 2018 ESA World Meeting (Berlin), 2018 Hong Kong University of Science and Technology Workshop on Experimental Economics, 2018 Xiamen University International Workshop on Experimental Economics, and 2020 ESA Global Online Meetings. Simin He acknowledges the National Natural Science Foundation of China (Grant 72473089) for its financial support. Bin Miao acknowledges the National Natural Science Foundation of China (Grant 72394394, 72131003).

## **Declarations**

**Funding** This research was supported by the National Natural Science Foundation of China under Grant No. 72473089, 72394394, and 72131003.

**Conflict of interest** None.

## 1 Introduction

Designing incentive contracts based on team output has become increasingly important in firms and organizations (Nyberg et al., 2018). Yet, it is challenging to design effective team contracts. In his seminal work on team incentives, Holmstrom (1982) observes that teamwork, while benefiting from complementarity in production, may suffer from the free-riding problem due to imperfect observability of individual inputs. To overcome this moral hazard problem, Holmstrom (1982) proposes a non-linear “budget-breaking” contract that either punishes or rewards the team contingent on joint output.<sup>1</sup> Similar forms of non-linear contracts have been implemented and proven successful in promoting efficiency (e.g., Spraggon, 2002; Friebe et al., 2017).<sup>2</sup>

Existing studies have largely relied on a principal to design and impose optimal incentive schemes for the teams. In the absence of a principal, self-managing teams, such as sales groups, professional partnerships, or project collaborators, often need to discipline themselves. In practice, many such self-imposed rules exhibit a “budget-breaking” feature. For example, sales teams may jointly agree to forgo their collective bonus if the group fails to meet performance targets; project teams may commit to tight deadlines at the risk of forfeiting resources or reputation; research collaborators may opt to submit their paper to a conference at an early stage, even before a complete draft is ready; and fundraising campaigns may adopt all-or-nothing funding rules under which creators receive no funds unless the campaign reaches its funding goal.<sup>3</sup>

In these arrangements, team members incur a cost when collective performance falls short of a target, rather than receiving a reward for exceeding it. Such penalty-based rules are particularly appealing in self-managing teams because they can be implemented through collective commitment without requiring external enforcement or additional resources. When budget-breaking incentives take this penalty-based form, they are typically strictly dominated: holding effort fixed, team members would always earn weakly higher payoffs without the

---

<sup>1</sup> Other solutions for moral hazard in teams include monitoring (Alchian and Demsetz, 1972), competition (Lazear and Rosen, 1981), social norms (Kandel and Lazear, 1992), and long-term interaction (Che and Yoo, 2001).

<sup>2</sup> Monitoring and competition have also been shown effective in the laboratory or field settings (e.g., Grosse, Putterman and Rockenbach, 2011; Bandiera, Barankay and Rasul, 2013). Other studies have also identified factors that affect team productivity, such as framing (Hossain and List, 2012) and feedback (Hamilton, Nickerson and Owan, 2003).

<sup>3</sup> For example, the crowdfunding platform Indiegogo historically allowed creators to choose between flexible funding (keep whatever is raised) and fixed funding (all-or-nothing). Despite fixed funding being dominated, empirical evidence shows such campaigns achieve higher success rates (Cumming, Leboeuf, and Schwienbacher, 2020).

contract. Nevertheless, penalty-based, budget-breaking rules are observed across a variety of self-managing teams. Whether teams can voluntarily implement such seemingly dominated incentives, and whether doing so improves performance, therefore remains an open question.

To examine this question, we conduct a laboratory experiment in which teams are given the opportunity to adopt a seemingly dominated, penalty-based incentive scheme. In the experiment, subjects first form teams of two and play a team production game under a conventional revenue-sharing incentive for fifteen rounds, in which free-riding constitutes the unique equilibrium. In a subsequent stage, which also lasts for fifteen rounds, teams are provided with the opportunity to switch to a strictly dominated incentive scheme that imposes an additional uniform cost on each team member if the efficient output level is not attained. This penalty-based scheme preserves the key budget-breaking feature emphasized by Holmstrom (1982), and introduces a payoff discontinuity at the efficient output level, giving rise to a symmetric equilibrium with efficient effort alongside the original free-riding equilibrium.

In our experiment, we study three systems to implement the dominated incentive scheme using a between-subject design. In the first system, the dominated scheme is exogenously imposed. In the other two systems, the scheme can be endogenously implemented through either majority voting or random leadership. Under majority voting, both team members vote between the revenue-sharing scheme and the dominated scheme. The voting outcome is then revealed, and the scheme receiving majority votes is implemented. In the event of a tie, the scheme is determined by a random tie-breaking rule. Under random leadership, both team members also vote for their preferred scheme, but only the vote of a randomly selected leader is revealed and implemented. Note that the selected leader does not observe the vote of the other team member.

Our main findings are threefold. First, both effort and payoffs increase under the dominated scheme, relative to the baseline revenue-sharing contract, regardless of whether the scheme is imposed exogenously or implemented endogenously. Under the dominated scheme, the free-riding problem is largely mitigated, and total output approaches the efficient level. Second, despite its effectiveness, the dominated scheme is not always implemented by the team under the two endogenous systems. The individual voting rate for the dominated scheme exhibits an increasing trend over time and stabilizes at approximately 70 percent under majority voting and 80 percent under random leadership, with consistently higher rates under random

leadership. Third, we document an asymmetric effect of voting information when the dominated scheme is endogenously implemented. Relative to remaining uninformed about the other member's vote under random leadership, learning that the other member votes against the dominated scheme under majority voting significantly reduces one's effort, whereas learning the other member also votes for the dominated scheme does not significantly increase effort. These patterns suggest that voting information may have a negative effect on effort under majority voting, while withholding such information under random leadership seems to mitigate this effect.

Our study contributes to the literature on team incentives by examining a dominated incentive scheme under different implementation systems. Existing laboratory and field studies have documented the positive effects of various exogenously imposed team incentives (see Charness and Kuhn, 2011 for a review), with a few focusing on non-linear team contracts (Nalbantian and Schotter, 1997; Spraggon, 2002; Friebe et al., 2017). In contrast, little is known about whether teams voluntarily adopt dominated schemes, and how such schemes perform when implemented through different institutions.<sup>4</sup> By comparing exogenous imposition with two endogenous implementation systems, we show that teams often choose to adopt a dominated incentive scheme when given the opportunity, and that once implemented, the scheme substantially increases effort and output across all systems.

Beyond contract effectiveness, our results point to an informational dimension along which implementation systems differ. Existing studies have primarily focused on voting-based systems and identified three channels through which endogenous institutions may outperform exogenous ones: selection effect through sorting, information effect conveyed by votes, and democracy effect associated with joint decision-making. While selection and democracy effects have been shown to play important roles, the information channel has received less attention (Dal Bó, Foster and Puttemann, 2010; Gallier, 2020). Our findings highlight the importance of the information channel and suggest that voting information does not always improve outcomes. In particular, information about disagreement may discourage effort, indicating that greater transparency is not always beneficial in team settings.

---

<sup>4</sup> Some studies show that endogenous team formation by self-selection can enhance the effects of team incentives (Badiera, Barankay and Rasul, 2013; Cooper, Ioannou and Qi, 2018). The incentives in these studies are not designed to tackle the moral hazard problem.

The remainder of this paper is organized as follows. Section 1.1 discusses related literature. Section 2 describes the experimental design and develops the theoretical predictions and hypotheses. Section 3 presents the experimental results. Section 4 concludes.

## 1.1 Related Literature

Several studies have examined target-based non-linear contracts in team production in laboratory and field settings, with mixed evidence on their effectiveness. Nalbantian and Schotter (1997) provide a systematic laboratory investigation of team incentive schemes. One of the schemes they study, termed target-based forcing contract, introduces non-linearity by paying team members a flat wage of zero if production target is not met. They find a temporary increase in team performance after switching from a baseline revenue-sharing contract to the forcing contract. Spraggon (2002) exogenously imposes a number of non-linear contracts, some of which are not dominated, and finds that only those contracts that generate a unique efficient equilibrium lead to sustained performance improvement. In the field, Hossain and List (2012) and Friebel et al. (2017) exogenously implement target-based reward or punishment incentives and report positive effects on team productivity. In contrast, Freeman et al. (2022) find that group targets have no effect on overall productivity in a real-effort experiment.<sup>5</sup>

In our setting, the dominated contract remains effective even when imposed exogenously, in contrast to the findings of Nalbantian and Schotter (1997). This difference reflects important distinctions in contract structure and experimental environment. In our design, the penalty takes the form of a uniform cost when the target is not reached, while the marginal incentives below the target remain unchanged. As a result, the original inefficient equilibrium is preserved alongside the efficient equilibrium. By contrast, the forcing contract in Nalbantian and Schotter (1997) alters marginal incentives and eliminates the original inefficient equilibrium. Moreover, our experimental setup does not involve output uncertainty, which is present in their design. These differences may render the efficient equilibrium in our setting less risky and more sustainable.

---

<sup>5</sup> A related but less central example of seemingly dominated institution is the threshold mechanism in public goods games. In a threshold mechanism, players can enjoy the benefits of the public good if and only if the sum of their contributions exceeds a predetermined threshold. As such, a threshold mechanism seems “dominated” by the conventional non-threshold voluntary contribution mechanism while creating incentives to produce a cooperative and efficient outcome. This latter observation is confirmed by numerous experimental studies (e.g., Suleiman and Rapoport, 1992; Cadsby and Maynes, 1999).

A separate but related strand of literature studies endogenous institutions and their role in promoting cooperation. Dannenberg and Gallier (2020) conduct a comprehensive review of the experimental evidence from prisoner’s dilemma games, public good games, and common-pool resource games, showing that individuals frequently choose institutions involving ex post punishment or reward, or ex ante minimum contribution requirements.<sup>6</sup> Relative to exogenous imposition, endogenous institutions are often associated with higher cooperation and efficiency, with the effects varying by institution features such as enforceability, deterrability, entry cost, and collective-choice rules.<sup>7</sup> To disentangle the channels through which endogenous institution operate, Dal Bó, Foster and Putterman (2010) develop a randomization technique and document a significant democracy premium. Compared to the democracy effect, selection effect and information effect tend to be smaller. Gallier (2020) adopts a similar approach and finds a relatively larger but statistically insignificant democracy effect, while selection and information effects remain limited. In relation to the literature on endogenous institution, our study introduces different collective-choice rules in team production and provides a detailed characterization of equilibrium behavior under each rule (see Section 2.3). In particular, our comparison of majority voting and random dictatorship highlights how the information conveyed by collective-choice rules can affect effort provision, pointing to a potential negative role of information in some endogenous institutions.

## 2 Experimental design and procedures, hypotheses

### 2.1 Treatment design

Our experiment adopts a team production environment in groups of two under different contracts. Table 1 summarizes the payoffs for each contract. In short, in a team of two members, each member exerts effort  $e_i$  with a quadratic cost  $e_i^2$ , where  $e_i$  is an integer between 0 to 20. The total output equals the sum of the effort levels times 20. Contract A is revenue-sharing in that each member splits the total output, and the final payoff of each member equals the revenue shared minus the effort cost incurred. In contrast, Contract B (dominated contract) pays the

---

<sup>6</sup> See Bohnet and Kübler (2005), Dal Bó, Foster and Putterman (2010), Dal Bó, Dal Bó and Eyster (2018) for studies on endogenous institutions in prisoner’s dilemma game; Sutter and Weck-Hannemann (2003, 2004), Güerker, Irlenbusch and Rockenbach (2006); Tyran and Feld (2006), Kosfeld, Okada and Riedl (2009), Sutter, Haigner and Kocher (2010), Andreoni and Gee (2012), Markussen, Putterman and Tyran (2014), Kamei, Putterman and Tyran (2015), Martinsson and Persson (2019), Gallier (2020) for studies in public good game; and Ostrom, Walker and Gardner (1992) for study in common-pool resource game.

<sup>7</sup> See for example, Kosfeld, Okada and Riedl (2009), Markussen, Putterman and Tyran (2014), Fan, Kwasnica and Thomas (2018), Gallier, Langbein and Vance (2018), Liu and van der Heijden (2019). Another relevant topic on endogenous institution is the flexibility of partnership. It has been shown in different settings that flexible partnership, where people can choose to dissolve relationship with their partners, can promote team cooperation and performance (Honhon and Hyndman, 2020; Hyndman and Honhon, 2020).

same as the baseline contract if the total output exceeds 400 (equivalent to total effort exceeds 20) and imposes an additional cost of 35 for each member if the total output falls (strictly) below 400.

Table 1. Game payoffs

Game/Contract	Payoff function
Contract A	$u_i = 10 (e_1 + e_2) - e_i^2$
Contract B	$u_i = 10 (e_1 + e_2) - e_i^2, \quad \text{if } 20(e_1 + e_2) \geq 400$ $u_i = 10 (e_1 + e_2) - e_i^2 - 35, \quad \text{if } 20(e_1 + e_2) < 400$

The detailed experimental setting consists of three parts. At the beginning, the subjects read the instructions and answer some comprehensive questions.

Part I consists of the first 15 periods (periods 1–15) of the experiment. At the beginning of Part I, all subjects are randomly assigned to a matching group of six. In each of the 15 periods, the subjects in the matching group of six are randomly matched into pairs to play Contract A. The matching is anonymous to avoid the reputation effect. At the end of each period, subjects learn the total output of the team and their own payoffs during that period. This part of the experiment enables all subjects to familiarize themselves with Contract A.

Part II consists of another 15 periods (periods 16–30) of the experiment. In this part, subjects remain in the same matching group as that in Part I, and are randomly matched into pairs in each of the 15 periods. There are three treatments in this part: the Baseline treatment, the Voting treatment, and the Leader treatment. The three treatments differ in how contracts are implemented. In the Baseline treatment, the contract implemented in each period is fixed as Contract B. In both Voting and Leader treatments, at the beginning of each period, the two team members have to endogenously decide which contract, A or B, should be implemented in the subsequent production stage.<sup>8</sup> In the Voting treatment, the two team members vote for the contract. The voting rule is majority, and in case of a draw, Contract A or B is implemented with equal chance. After learning the exact vote shares as well as the chosen contract, the team members proceed to the production stage. In the Leader treatment, the team members first

<sup>8</sup> Note that in each period, subjects within a matching group are randomly matched in a pair. Therefore, at the beginning of each period, we let the randomly matched pair of subjects choose the contract they would like to play in that period. The goal of this design is to test how contract choice behavior involve over time.

choose between Contracts A and B. Then, one of them is randomly chosen as the team leader, whose previously chosen contract will be implemented. After learning the leader of the team and their chosen contract, the team members proceed to the production stage. In all treatments, similar to part I of the experiment, subjects learn the total output as well as their own payoffs at the end of that period. Details of the different treatments are summarized in Table 2.

Table 2. Treatments overview

Treatment	Periods 1–15	Periods 16–30	No. of subjects	No. of groups	No. of sessions
Baseline	Contract A, Exogenous	Contract B, Exogenous	90	15	8
Voting	Contract A, Exogenous	Contract A or B, Endogenous	90	15	8
Leader	Contract A, Exogenous	Contract A or B, Endogenous	90	15	8

Two features of our treatment design warrant discussion. First, we do not include a treatment with exogenous Contract A in Part II of the experiment. As a result, comparisons involving Contract A across different parts of the experiment may be subject to bias, unless one assumes a perfect restart of behavior under exogenous Contract A at the beginning of Part II. We therefore exercise caution in making such comparisons and explicitly discuss the potential direction of any resulting bias when interpreting the results.

Second, in the Voting treatment, teams consist of two members, and disagreement are resolved by random tie-breaking. This procedure may affect behavior through channels such as emotional responses to lottery outcomes or perceptions of procedural fairness. Our subsequent analysis focuses on behavior under Contract B across different implementation systems. As shown in Section 3.2 (Table 6), under Contract B, effort levels do not differ significantly between subjects who vote for Contract A and those who vote for Contract B. This pattern suggests that, under Contract B, behavioral responses associated with random tie-breaking play a limited role in shaping effort choices.

Part III consists of two individual decision-making tasks that aim to elicit individual risk preference and social preference with real incentives. We elicit subjects' risk attitude using a simple task proposed by Eckel and Grossman (2008), with one additional option to capture risk-seeking behavior. In this method, a subject chooses among six even-chance gambles that

vary in expected value and variance. From Gambles 1 to 6, the expected value decreases, as does the variance. A higher choice indicates a higher level of risk aversion. Social preference elicitation follows a similar protocol. A subject chooses among seven allocations, each delivering certain payoffs for themselves and an anonymous person from a different experiment to be conducted by the researcher. The seven allocations vary in the degree of equity and efficiency, with allocation 1 being the most selfish option and allocation 4 the most efficient (see Appendix A for the detailed instructions of both tasks).

## 2.2 Procedures

The experiment was conducted at a large public Chinese university in 2019. The subjects were recruited from the subject pool through Weikeyan (a platform for social sciences experiments in China). We ran eight sessions in total. To minimize the session effect, we ran all three treatments simultaneously in each session. Each session consisted of 30 or 36 participants. A total of 270 Chinese subjects were recruited and equally distributed across the three treatments. The subjects were undergraduate students from various disciplines at Wuhan University. 41% were male. Table 2 presents the number of subjects, number of independent matching groups, and number of sessions in each treatment.

The experiment was computerized using z-Tree (Fischbacher, 2007) and was conducted in Chinese.<sup>9</sup> Upon arrival, subjects were randomly assigned a card indicating their table number and were seated in the corresponding cubicle. All instructions were displayed on their computer screens. Control questions were asked to check their understanding of the instructions. After completing the control questions for Part I (periods 1–15) and Part II (periods 16–30), the subjects were provided handouts of the summarized instructions of the corresponding part. The same experimenters were always present during the experimental sessions.

After finishing the experiment, the subjects received their earnings via WeChat payment privately. The average earnings were CNY 45 (approximately USD 7), including a show-up fee of CNY 15 (approximately USD 2). Each session lasted between 60 and 70 minutes.

---

<sup>9</sup> The English translations are provided in Appendix A.

### 2.3 Theoretical predictions

This section analyzes behavioral predictions in our experimental environment. We first characterize equilibrium effort choices under the two contracts in the production stage. We then examine equilibrium contract choice behavior in the endogenous institution treatments, applying the notion of pure-strategy sequential equilibrium.

*Production Stage:*

*Contract A:* Under Contract A, there exists a unique equilibrium effort profile (5, 5), where  $e_i = 5$  is a dominant strategy for each player. In this outcome, each player obtains a payoff of 75. The efficient effort profile is (10, 10), which would yield a payoff of 100 for each player.

*Contract B:* Under Contract B, the penalty for failing to reach the output threshold gives rise to multiple equilibrium effort profiles. First, the inefficient profile (5, 5) remains an equilibrium, since the penalty of 35 does not affect marginal incentives at that profile. Meanwhile, an efficient symmetric effort profile (10, 10) arises: the penalty creates a payoff discontinuity at the threshold ( $e_1 + e_2 = 20$ ), making it optimal for each player to choose  $e_i = 10$  when expecting the other to do the same, since any downward deviation would trigger the penalty and reduce payoffs.<sup>10</sup>

In addition to these two symmetric profiles, Contract B also admits a continuum of asymmetric effort profiles in the continuous effort case. Specifically, any effort profile  $(e_1, e_2)$  such that  $e_1 + e_2 = 20$  and  $e_i \in [15 - \sqrt{35}, 5 + \sqrt{35}]$  constitutes an equilibrium.<sup>11</sup> However, under the integer effort constraint implemented in our experiment, these asymmetric profiles cannot be sustained, making (10, 10) the unique efficient equilibrium under Contract B. Moreover, the results reported in Section 3 show that subjects predominantly coordinate on symmetric effort profiles rather than asymmetric ones. We therefore focus on the symmetric profiles (5,5) and (10,10) in the subsequent analysis.

---

<sup>10</sup> Between the two, one can verify that (5, 5) is risk-dominant while (10, 10) is payoff-dominant.

<sup>11</sup> To see this, consider an effort profile  $(e_i, e_j)$  such that  $e_i + e_j = 20$ . For it to be an equilibrium, no player should profitably deviate to the stage-game dominant strategy  $e = 5$ . This requires for any player  $i$ , the condition  $200 - e_i^2 \geq 10(5 + e_j) - 5^2 - 35$  should hold. Substituting  $e_j = 20 - e_i$  yields  $e_i^2 - 10e_i - 10 \leq 0$ , which implies  $e_i \leq 5 + \sqrt{35}$  and  $e_j \geq 15 - \sqrt{35}$ . Thus, any effort profile  $(e_1, e_2)$  satisfying  $e_1 + e_2 = 20$  with  $e_i \in [15 - \sqrt{35}, 5 + \sqrt{35}]$  is an equilibrium. In our discrete strategy space,  $e_i = 10$  is the unique integer satisfying this condition.

*Contract Choice in Endogenous Institutions:*

Next, we analyze contract choices in the Voting and Leader treatments. Both treatments implement Contract B with a fifty-percent probability when the two members vote differently. Because the stage game under Contract B admits multiple equilibrium effort profiles, contract choice depends on which effort profile is selected in equilibrium. We focus on equilibria that satisfy that following criterion: efficient coordination on (10,10) is weakly more likely when both members vote for Contract B than when only one does. Intuitively, unanimous support for Contract B signals a stronger willingness to pursue the efficient outcome. Accordingly, if members can coordinate on (10, 10) when votes differ and Contract B is implemented, they should also coordinate on (10, 10) when both vote for Contract B.

*Voting Treatment:* In the Voting treatment, both members vote simultaneously, and the distribution of votes is common knowledge. Contract choices can be analyzed by examining how stage-2 efforts depend on the stage-1 voting outcome and the implemented contract. Focusing on the symmetric equilibrium effort profiles (5, 5) and (10, 10) under Contract B, three cases can occur. First, if members coordinate on the efficient profile (10, 10) whenever Contract B is implemented, then voting for B is a dominant strategy at stage 1, since unilaterally voting for B increases the probability of that Contract B is implemented and hence raises expected payoffs. Second, if members instead coordinate on the inefficient profile (5, 5) whenever B is implemented, both members vote for A at stage 1. Third, if efficient coordination on (10, 10) under contract B occurs only when both vote for B, while voting differently leads to Contract B being implemented with probability 0.5 and coordination on (5, 5), the voting stage becomes a coordination problem. In this case, both unanimous voting for A and unanimous voting for B can be sustained as equilibrium contract choices, since any unilateral deviation results in a lower expected payoff.<sup>12</sup>

*Leader Treatment:* In the Leader treatment, both members again vote simultaneously, but the contract implemented in stage 2 is determined solely by the leader's vote. Although the other member has private information about her own vote, her equilibrium stage-2 effort choice is to coordinate with the leader, regardless of her own vote. As a result, contract choice can be analyzed by focusing on the leader's decision. As in the Voting treatment, stage-1 voting

---

<sup>12</sup> Two members voting differently and coordinating at the efficient profile if Contract B is eventually implemented can also be supported as an equilibrium outcome, if both members voting for Contract B ends up generating the inefficient output. However, such an equilibrium does not satisfy our selection criteria.

depends on which equilibrium effort profile arises under contract B. Two cases can occur. First, if implementing Contract B leads to coordination on the efficient profile (10, 10), voting for B is a dominant strategy for both members ex ante. Second, if Contract B instead leads to coordination on the inefficient profile (5, 5), each member votes for A. Unlike in the Voting treatment, the leader treatment involves no coordination problem at stage 1, since only the leader's vote affects which contract is implemented. Consequently, once behavior under Contract B is specified, stage-1 contract choice is uniquely determined.

## 2.4 Hypotheses

Based on the theoretical analyses in Section 2.3, we derive three hypotheses to be tested in the experiment.

First, contract A induces a unique equilibrium effort profile (5, 5), whereas Contract B admits an additional symmetric efficient equilibrium effort profile (10, 10). Thus, when Contract B is implemented, whether exogenously or endogenously, we expect the subjects to increase their effort compared with that under Contract A.

***Hypothesis 1.** In all treatments, effort levels are higher under Contract B than under Contract A.*

Next, consider the comparison between endogenously selected and exogenously imposed Contract B. When Contract B is selected endogenously (on the equilibrium path) in the Voting or Leader treatment, members coordinate on the efficient profile (10, 10). In contrast, when Contract B is imposed exogenously, both (5, 5) and (10, 10) remain possible equilibrium outcomes. Hence, endogenously selected Contract B should induce higher effort than exogenously imposed Contract B.

***Hypothesis 2.** Effort levels are higher when Contract B is selected endogenously, compared to when Contract B is imposed exogenously.*

Third, we compare the two endogenous institutions. In the Voting treatment, a member's incentive to vote for Contract B depends not only on whether the efficient profile (10, 10) can be sustained under Contract B, but also on whether the other member will vote for B. When efficient coordination requires unanimity, voting for B carries an additional strategic risk: if votes differ and Contract B is implemented via tie-breaking, coordination at the efficient profile may fail. In contrast, in the Leader treatment, stage-2 coordination does not depend on vote

alignment. Consequently, voting for B does not involve this coordination risk provided that efficient coordination under contract B is expected. Intuitively, the absence of information about the non-leader's vote precludes conditioning stage-2 coordination on voting unanimity, thereby removing the stage-1 strategic uncertainty. Hence, we postulate that Contract B is implemented more frequently in the Leader treatment than in the Voting treatment.

***Hypothesis 3.*** *Contract B is implemented more often in the Leader treatment than in the Voting treatment.*

### 3 Results

#### 3.1 Efforts and payoffs under Contract A and Contract B

We begin by examining how subjects' behavior under dominated Contract B differs from that under conventional revenue-sharing Contract A. In total, there are six different conditions depending on the treatment and contract: *B-A*, *B-B*, *V-A*, *V-B*, *L-A*, and *L-B*. The first letter refers to the treatment names (B for Baseline, V for Voting, and L for Leader). The second letter refers to the contract implemented, Contract A or Contract B. *B-A* includes observations of periods 1–15 in all the three treatments.<sup>13</sup> *B-B* includes observations of periods 16–30 in the Baseline treatment. *V-A* and *V-B* include observations of periods 16–30 in the Voting treatment: it is *V-A* (*V-B*) if subjects endogenously choose Contract A (B). Similarly, *L-A* and *L-B* include observations of periods 16–30 in the Leader treatment: *L-A* (*L-B*) means the leader of a pair endogenously chooses Contract A (B).

Figure 1 shows the average effort level over time for each condition. The effort levels under Contract A in the first 15 periods gradually decline and converge to an equilibrium level of 5. In the last 15 periods, the effort levels differ across different conditions. For those conditions implementing Contract A (*V-A* and *L-A*), the effort levels are close to the equilibrium level of 5. In contrast, for those conditions implementing Contract B (*B-B*, *V-B*, and *L-B*), effort levels are much higher and almost reach 10, the efficient equilibrium level.

---

<sup>13</sup> Given that there is no ex-ante difference in periods 1–15 across treatments, in *B-A* we pool observations from all the three treatments together (only periods 1–15). This means that *V-A* and *L-A* only include the self-selected Contract A in periods 16–30.

Figure 1. Effort level over time by contract and treatments.

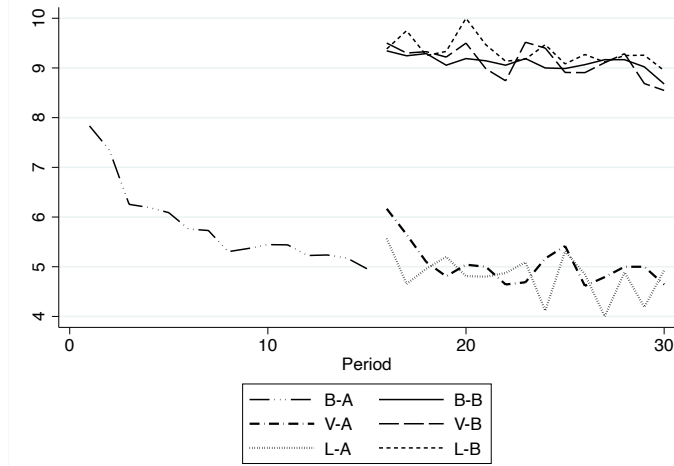


Table 3 presents the average effort level in each condition, and the Mann–Whitney tests between conditions under Contract A and under Contract B. We find that effort levels are always significantly higher under Contract B than under Contract A, regardless of how the contracts are implemented. These results demonstrate that people indeed exert a much higher effort level under Contract B than under Contract A, which is consistent with Hypothesis 1.

Table 3. Effort levels by conditions

Condition	B-A	V-A	L-A	B-B	V-B	L-B
Effort levels	5.82	5.30	4.73	9.11	8.87	9.25
Test equal to B-A				(<0.001)	(<0.001)	(<0.001)
Test equal to V-A				(<0.001)	(<0.001)	(<0.001)
Test equal to L-A				(<0.001)	(<0.001)	(<0.001)

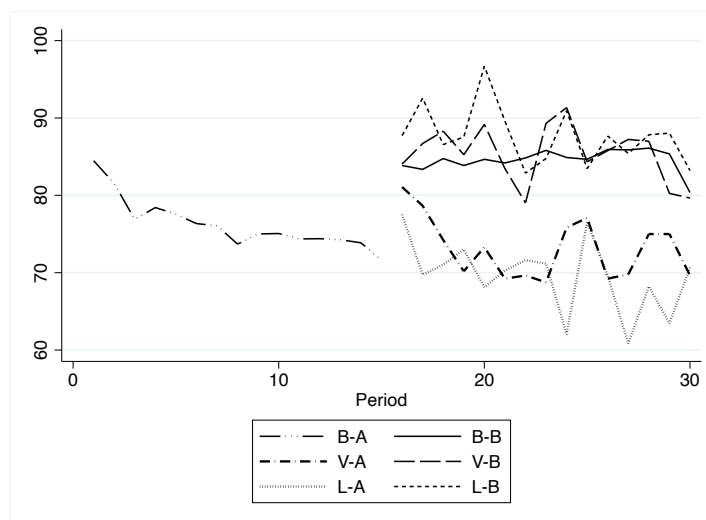
*Notes:* Statistical tests report p-values of two-sided Mann–Whitney tests. Observations are at the matching group level (matching group  $n = 45$  in B-As, and  $n = 15$  in all other conditions).

As discussed in Section 2.1, we do not include a treatment with exogenous Contract A in the Part II of the experiment, which may introduce potential bias in comparing other treatments to B-A. Given the decreasing pattern shown in Figure 1, if efforts had continued to decline over time, the observed treatment differences between B-A and treatments where Contract B is implemented (including B-B, V-B, L-B) would likely be underestimated. Since these differences are all significant, it is reasonable to assume that they would be even larger and remain significant if a B-A treatment had been included in Part II.<sup>14</sup>

<sup>14</sup> In our results section, we do not focus on comparing the effort levels when Contract A is implemented differently across B-A, V-A, and L-A. However, for the same reason, the observed decrease in effort levels from B-A to V-A and from B-A to L-A is likely overestimated.

**Result 1a.** *Regardless of how the contract is implemented, the effort levels under Contract B are always higher than those under Contract A.*

Figure 2. Payoff level by treatment conditions



Next, we compare the payoff levels across the six conditions. Figure 2 shows the average payoff levels over time for each condition. In the first 15 periods, the payoff levels decline and converge to an equilibrium level of 75. In the last 15 periods, when Contract A is implemented (*V-A* and *L-A*), payoffs are similar but more volatile compared to those in the first 15 periods and yield a mildly declining pattern. When Contract B is implemented (*B-B*, *V-B*, and *L-B*), payoffs are much higher, lying between 80 and 95.

Table 4. Payoff levels by conditions

Condition	B-A	V-A	L-A	B-B	V-B	L-B
Payoff levels	76.24	74.87	68.68	84.57	80.94	86.33
Test equal to B-A				(0.002)	(0.149)	(<0.001)
Test equal to V-A				(0.007)	(0.191)	(0.003)
Test equal to L-A				(0.004)	(0.049)	(<0.001)

*Notes:* Statistical tests report p-values of two-sided Mann–Whitney tests. Observations are at the matching group level (matching group  $n = 45$  in B-As, and  $n = 15$  in all other conditions).

Table 4 presents the average payoff level in each condition, and the Mann–Whitney tests between conditions under Contract A and conditions under Contract B. We find that payoff levels are generally higher under Contract B than under Contract A, and the differences are significant in most of the comparisons, except for two (*B-A* vs. *V-B*, *V-A* vs. *V-B*). This is understandable because failure to meet the target under Contract B incurs an additional cost

and may result in a strictly lower payoff compared with the equilibrium payoff under Contract A, even though the subjects exert strictly higher effort levels under Contract B.

**Result 1b.** *Payoff levels are generally higher under Contract B than under Contract A.*

Finally, we compare the subjects' behavior across the three different conditions in which Contract B is implemented. According to Hypothesis 2, subjects should exert higher effort when Contract B is endogenously selected, since in all the equilibria in the Voting and Leader treatments, only those subjects who expect to exert the efficient effort level shall choose B in the first stage. Table 5 shows that the effort levels in the three conditions are not significantly different from each other (Mann–Whitney test), which means that the endogenously implemented Contract B fails to improve effort compared to the exogenously implemented Contract B. This is inconsistent with Hypothesis 2, and we shall further investigate this issue in subsequent analyses.

Table 5. Effort levels under Contract B

Condition	B-B	V-B	L-B
Effort levels	9.11	8.87	9.25
Test equal to Baseline		(0.468)	(0.662)
Test equal to Voting			(0.575)

*Notes:* Statistical tests report p-values of two-sided Mann–Whitney tests. Observations are at matching group level (n = 15 in all treatments).

**Result 2.** *Inconsistent with Hypothesis 2, effort levels under Contract B are not significantly different across the different implementations.*

### 3.2. Decomposing the effect of self-selection

Result 1 shows that efforts levels in Contract B are higher than in Contract A. However, when contracts are chosen endogenously, the difference in effort levels may be driven by another factor: teams with endogenous Contract B may differ from those with endogenous Contract A, as participants in the former may have a greater preference for cooperative behavior, representing a self-selection effect. We can decompose the effects of self-selection in the endogenous contracts by examining participants' contract choices in period 16.<sup>15</sup>

<sup>15</sup> To identify self-selection, we use an approach that is similar to Dal Bó, Foster and Putterman (2010) by considering participants' contract choices, except that we do not elicit contract choices in the Baseline (exogenous) treatment. We do not adopt the method from Dal Bó, Foster and Kamei (2024) because the focus of this paper is not specifically on the 'democracy

Table 6. Efforts by treatment, implemented contract and contract choice

Panel A. Pre-treatment effort in Period 15, under exogenous Contract A				
Baseline				4.96 (n=270)
Voting	<i>Subsequent Choose A</i>			5.51 (n=49)
	<i>Subsequent Choose B</i>			4.51 (n=41)
	Test (A=B)			(0.034)
Leader	<i>Subsequent Choose A</i>			5.09 (n=32)
	<i>Subsequent Choose B</i>			4.93 (n=58)
	Test (A=B)			( $p=0.656$ )
Panel B. Effort in Period 16 by implemented contract and contract choice				
		Contract A	Contract B	Pool
Baseline	<i>Exo</i>		9.34 (n=90)	
Voting	<i>Endo-Choose A</i>	6.53 (n=32)	9.47 (n=17)	7.55 (n=49)
	<i>Endo-Choose B</i>	5.00 (n=10)	9.51 (n=31)	8.41 (n=41)
	Test (A=B)	( $p=0.009$ )	( $p=0.843$ )	( $p=0.991$ )
Leader	<i>Endo-Choose A</i>	5.47 (n=19)	9.31 (n=13)	7.03 (n=32)
	<i>Endo-Choose B</i>	5.72 (n=11)	9.40 (n=47)	8.71 (n=58)
	Test (A=B)	( $p=0.825$ )	( $p=0.872$ )	( $p=0.496$ )

*Notes:* Each cell represents the average effort levels for each condition, classified by (subsequent) treatment, implemented contract, and (subsequent) contract choice. The number of individual observations is shown in parentheses. The  $p$ -values for two-sided Mann–Whitney tests, performed at the matching group level, are displayed in parentheses in the last row of each treatment.

Table 6 presents average effort levels by treatment, implemented contract (A or B), and contract choice in period 16 (choose A or B). Within each treatment and implemented contract, we compare effort levels between *Endo-Choose A* and *Endo-Choose B* to assess the self-selection effects.

As shown in Panel B of Table 6, in period 16 of Voting treatment, when Contract A is implemented, participants who choose Contract A exert significantly higher effort than those who choose Contract B, indicating a reversed selection pattern. No other comparison in Panel B shows statistically significant difference, suggesting that participants who choose Contract B are not systematically more cooperative than those who choose Contract A.

---

effect,' which examines the effect of one's choice being implemented. Instead, we focus on the effect of endogenous institution through other channels, such as participants' understanding of the new equilibrium in the dominated contract, signaling their willingness to cooperate, etc. Therefore, it is more crucial to examine whether more cooperative participants select the dominated contract, which can be observed using the approach in Dal Bó, Foster and Putterman (2010).

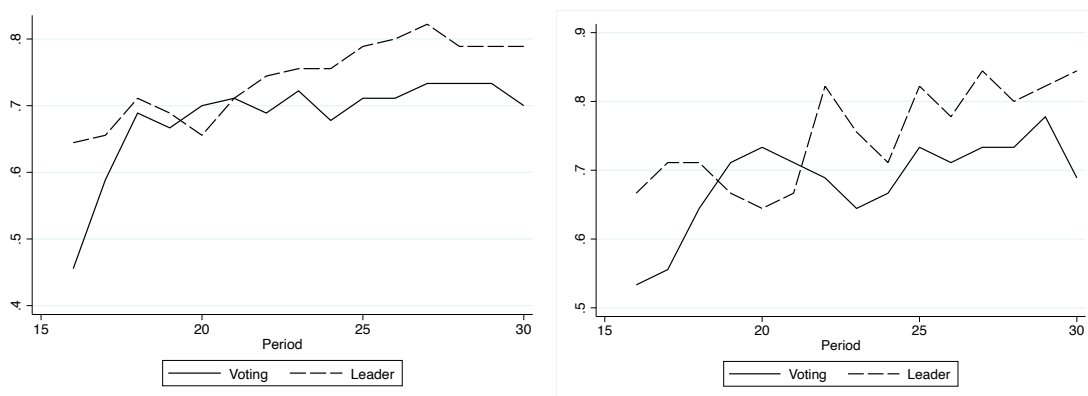
We next examine effort levels in period 15, reported in Panel A of Table 6. In the Voting treatment, participants who subsequently choose Contract A in period 16 exert significantly higher effort than those who choose Contract B (5.51 vs. 4.51,  $p=0.034$ ), again suggesting a reversed selection effect.

Overall, we find no evidence that more cooperative participants, as indicated by their effort levels, tend to choose Contract B. If anything, effort patterns suggest reversed selection in the Voting treatment, implying that the effort difference between endogenous Contract B and endogenous Contract A could be underestimated.

### 3.3 Endogenous institutions: Voting vs. Leader

In this subsection, we deepen our analyses of endogenous institutions by closely comparing subjects' behaviors in the Voting and Leader treatments. We start by comparing the subjects' contract choice behaviors in these two treatments. Figure 3 shows the individual contract choice rate (left panel) and the implementation rate (right panel) of Contract B over time for these two treatments. We first look at the subjects' choice behavior in period 16, which is driven purely by the switch from an exogenous system to an endogenous system. We find that subjects in Leader are significantly more likely to choose Contract B than those in Voting (64% vs. 46%, two-sided Mann–Whitney test,  $p = 0.016$ ). When accounting for the 15 periods in total, subjects in Leader still choose Contract B more often compared to subjects in Voting (74% and 68%, two-sided Mann–Whitney test,  $p = 0.079$ ).

Figure 3. Individual voting rate (left panel) and implementation rate (right panel) of Contract B over time.



To further investigate this difference, we perform an OLS regression using the contract choice data in period 16. The dependent variable is the individual contract choice (equals 1 if a subject

chooses Contract B, and 0 otherwise). The independent variables include subjects' effort and payoff levels in period 15 and individual characteristics such as risk and social preferences. Table 7 presents factors significantly affecting contract choice behavior. We can see that subjects' effort levels in period 15 significantly affect their contract choice in period 16: the higher the effort level, the less likely it is that one chooses contract B. Moreover, more risk-averse subjects are less likely to choose Contract B, which is intuitive because the efficient equilibrium in Contract B is riskier. Both effort choices and risk attitudes are endogenous factors of the subjects. Table 7 shows that being exogenously assigned to the Leader treatment significantly increases one's chance to choose Contract B at a rate of 0.195. In sum, these results suggest that the higher rate of choosing Contract B in Leader is likely to be driven by the treatment itself, which supports Hypothesis 3.

Table 7. Determinants of voting Contract B in period 16

	Choosing Contract B in period 16
Leader	0.195*** (0.072)
Effort_p15	-0.057*** (0.017)
Risk averse	-0.232*** (0.079)
Observations	180
R-squared	0.149

*Notes:* OLS estimates. Dependent variable: 1 if a subject chooses Contract B in period 16. "Effort\_p15" is the effort level subject choose in the period 15. Robust standard errors in parentheses, fixed effects at individual level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

**Result 3.** *Consistent with Hypothesis 3, subjects in Leader are significantly more likely to choose Contract B than subjects in Voting. This pattern persists over time.*

Next, we examine the subjects' effort choices upon the implementation of Contract B in the two endogenous treatments. Recall that in the Voting treatment, subjects always learn the contract choice of their counterpart, while the leaders in the Leader treatment are not informed of other member's contract choice. As such, we investigate how subjects' effort levels differ when they receive different information about contract choice. Table 8 presents the average effort levels under contract B across treatments for periods 16–30. The first (second) number in each cell represents the effort level of oneself (the other player). Note that in both

endogenous treatments, Contract B can be implemented under two voting conditions: when both subjects choose B and, when one chooses A and the other chooses B.

Table 8. Effort in Voting and Leader under Contract B, by different voting condition

	Treatment	
Contract B	<i>Baseline</i>	9.11, 9.11
		Self B, Other A      Self B, Other B
	<i>Voting</i>	7.63, 7.21      9.69, 9.69
	<i>Leader</i>	9.52, 7.68      9.52, 9.57
	Test V = L	(0.0135, 0.9825)      (0.4622, 0.8034)

*Notes:* In each cell, the first number represents the choices of the row players (self), and the second number represents the choices of the column players (other). Numbers in parentheses are the  $p$ -values of two-sided Mann–Whitney tests of Voting and Leader under the same condition (tests are performed at the matching group level).

When Contract B is exogenously imposed (Baseline), the average effort level is 9.11. In the Voting treatment, when one subject chooses B and the other chooses A, their corresponding effort levels are 7.63 and 7.21 and not significantly different from each other ( $p = 0.6113$ ).<sup>16</sup> When both subjects choose B, the average effort levels are 9.69, which is significantly higher than 7.63 ( $p = 0.0120$ ) and 7.21 ( $p = 0.0307$ ). In the Leader treatment, when the leader chooses B and the other chooses A, the average effort level of the leader is higher than that of the other (9.52 vs. 7.68,  $p = 0.0232$ ). When both subjects choose B, their effort choices are almost identical (9.52 and 9.57,  $p = 0.4662$ ). Comparing across treatments, subjects who choose B and learn that the other chooses A in Voting exerts significantly lower effort than subjects who choose B but do not observe the other’s contract choice in Leader (7.63 vs. 9.52,  $p = 0.0135$ ).

Overall, these results suggest that when Contract B is implemented endogenously, subjects’ effort choices are affected by not only their own contract choices but also the information they receive about the other’s contract choice. When contract choices differ, learning about disagreement is associated with lower effort under Contract B relative to the case in which Contract B is exogenously implemented, which may weaken the aggregate effect of endogenous institutions and contribute to the observed similarity between exogenous and endogenous Contract B in Result 2. Moreover, in the Leader treatment, the absence of information about the other’s contract choice is associated with sustained high effort by leaders

<sup>16</sup> All the  $p$ -values in this paragraph are from two-sided Mann–Whitney tests, and the tests are performed at the matching group level.

under Contract B, suggesting that the lack of negative information about disagreement may facilitate coordination under Contract B in the Leader treatment.

**Result 4.** *In both Voting and Leader, when Contract B is implemented, subjects who choose Contract A exert a lower effort than subjects who choose Contract B. For subjects who choose Contract B, they exert lower effort when learning that the other chooses Contract A, compared to when they learn that the other chooses Contract B, or remain ignorant of the other's contract choice.*

Finally, we use OLS regressions to investigate the factors that affect contract choices and effort choices in periods 16–30. Regarding contract choice (columns 1-2 in Table 9), we find that both choosing Contract B and experiencing Contract B in the previous period significantly increase the likelihood of choosing Contract B in the current period. In contrast, if one's team plays Contract B but fails to meet the target level in the previous period, it significantly decreases the likelihood that one chooses Contract B. These results suggest that subjects learn to adopt Contract B over time. Moreover, after experiencing Contract B in the previous period, whether they choose Contract B again depends critically on whether they meet the target level previously.

We next turn to effort choice. When Contract A is implemented (columns 3-4), neither a subject's current contract choice nor contract choices and experience in the previous period has a significant effect on effort choices in either the Voting and Leader treatment. This pattern is consistent with the existence of a unique equilibrium under Contract A. When Contract B is implemented (columns 5-6), choosing Contract B, both in the current and in the previous period, significantly increases one's effort in the Leader treatment but not in the Voting treatment. Moreover, in the Voting treatment, learning that the other also chooses B significantly increases one's own effort, while being selected as the leader (and having one's own choice of Contract B implemented) has no significant effect on effort choice in the Leader treatment. These results are aligned with the observations in Table 8, which highlight the effect of information in determining individual effort choices. Finally, while experiencing Contract B in the previous period positively influence efforts in the current period, playing B but failing to meet the target negatively impacts effort.

Table 9. Effort choices under Contract B (periods 16-30)

	(1) Contract Choice		(3) Effort Choice (A)		(5) Effort Choice (B)	
	Voting	Leader	Voting	Leader	Voting	Leader
Choose Contract B			-0.208 (0.380)	-0.102 (0.368)	-0.152 (0.511)	0.741** (0.360)
Self chooses B × Other Chooses B			0.000 (.)		1.934*** (0.399)	
Self Chooses B × Selected Leader				0.000 (.)		0.072 (0.105)
Choose Contract B_lag	0.700*** (0.040)	0.698*** (0.031)	-0.262 (0.298)	-0.529 (0.388)	0.473 (0.393)	0.791*** (0.284)
Contract B_lag	0.147*** (0.034)	0.096*** (0.029)	-0.407 (0.400)	0.185 (0.365)	0.949*** (0.341)	0.939*** (0.284)
Fail to meet target_lag	-0.161*** (0.046)	-0.233*** (0.036)	0.690 (0.497)	-0.022 (0.437)	-2.174*** (0.623)	-2.265*** (0.415)
Payoff_lag	0.001 (0.001)	-0.001** (0.000)	0.006* (0.003)	0.010 (0.006)	-0.004 (0.007)	-0.000 (0.005)
Constant	0.027 (0.070)	0.171** (0.069)	5.726*** (0.574)	3.702*** (0.634)	7.073*** (0.551)	7.195*** (0.603)
Periods Controls	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
<i>N</i>	1260	1260	384	306	876	954
<i>R</i> <sup>2</sup>	0.677	0.589	0.084	0.072	0.407	0.324

Notes: OLS estimates. Dependent variable: contract choice (1-2), effort choice (3-6). “Choose Contract B” indicates whether a subject chooses Contract B in the current period. Both choose B “Self chooses B × Other Chooses B” indicates whether both players choose Contract B in the current period. “Self Chooses B × Selected Leader” indicates whether a subject chooses B and is selected as the leader in the current period. “Choose Contract B\_lag” indicates whether a subject chooses Contract B in the previous period. “Contract B\_lag” indicates whether a subject experiences Contract B in the previous period. “Fail to meet target\_lag” indicates whether a subject fails to meet the target level if Contract B is implemented. “Payoff\_lag” is the payoff a subject receives in the previous period. “Periods” are controlled using period dummy variables. Robust standard errors in parentheses, fixed effects at individual level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

In our experimental design, subjects remain in the same matching group of six and are randomly re-matched into pairs each period. As a result, choices may be influenced both by lagged personal experience and by learning about others’ behavior within the matching group. To assess the robustness of our findings along these dimensions, we re-estimate the same regressions separately for the early (periods 16-20), middle (periods 21-25), and late (periods 26-30) stages of Part II. The corresponding results are reported in Tables 10-12.<sup>17</sup>

<sup>17</sup> In the Appendix, Tables B2-B5 present regressions results for periods 16-30, 16-20, 21-25, and 26-30, respectively, including additional control variables such as risk preference, social preference, gender, and university grade, etc. The results are largely consistent with those reported in Tables 9-12, which exclude these controls.

For contract choice, most results remain robust. One exception is that the positive effect of having experienced Contract B in the previous period appears only in periods 16-25, but not in the final five periods, possibly because participants have accumulated sufficient experience by then. For effort choice, when Contract A is implemented, all findings remain robust across the three stages. When Contract B is implemented, most results are also stable, with two exceptions: choosing Contract B in the current period has a positive effect only in the early stage of the Voting treatment, and the positive effect of choosing Contract B in the previous period is confined to the middle stage in both treatments. Overall, the robustness of most results indicates that learning about others' behavior within the matching group does not play a major role.

Taken together, the analyses of individual contract and effort choices suggest that participants may learn to play Contract B through positive feedback, which may explain the increase in Contract B choices observed in Figure 3. More importantly, the information effect identified at the aggregate level (Result 4) also persists at the individual level. These main findings remain stable across the three stages of Part II of the experiment.

Table 10. Effort choices under Contract B (periods 16-20)

	(1)	(2)	(3)	(4)	(5)	(6)
	Contract Choice		Effort Choice (A)		Effort Choice (B)	
	Voting	Leader	Voting	Leader	Voting	Leader
Choose Contract B			-0.400 (0.416)	0.700 (0.639)	0.786 (0.604)	0.806** (0.346)
Self chooses B × Other Chooses B			0.000 (.)		1.237** (0.497)	
Self Chooses B × Selected Leader				0.000 (.)		-0.106 (0.191)
Choose Contract B_lag	0.598*** (0.054)	0.626*** (0.051)	0.183 (0.396)	-0.314 (0.512)	-0.260 (0.368)	0.143 (0.348)
Contract B_lag	0.160*** (0.055)	0.144** (0.056)	-0.290 (0.399)	-0.284 (0.390)	0.011 (0.376)	0.909** (0.394)
Fail to meet target_lag	-0.157** (0.073)	-0.287*** (0.080)	0.467 (0.563)	0.311 (0.633)	-1.816** (0.856)	-1.848** (0.766)
Payoff_lag	0.001 (0.001)	-0.001 (0.001)	0.009 (0.006)	0.006 (0.011)	-0.000 (0.009)	-0.004 (0.010)
Constant	0.032 (0.102)	0.177* (0.104)	5.374*** (0.618)	4.476*** (1.120)	8.319*** (0.708)	8.045*** (0.742)
Periods	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No
<i>N</i>	360	360	122	114	238	246
<i>R</i> <sup>2</sup>	0.537	0.491	0.070	0.030	0.353	0.249

Notes: OLS estimates. Dependent variable: contract choice (1-2), effort choice (3-6). “Choose Contract B” indicates whether a subject chooses Contract B in the current period. Both choose B “Self chooses B × Other Chooses B” indicates whether both players choose Contract B in the current period. “Self Chooses B × Selected Leader” indicates whether a subject chooses B and is selected as the leader in the current period. “Choose Contract B\_lag” indicates whether a subject chooses Contract B in the previous period. “Contract B\_lag” indicates whether a subject experiences Contract B in the previous period. “Fail to meet target\_lag” indicates whether a subject fails to meet the target level if Contract B is implemented. “Payoff\_lag” is the payoff a subject receives in the previous period. “Periods” are controlled using period dummy variables. Robust standard errors in parentheses, fixed effects at individual level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 11. Effort choices under Contract B (periods 21-25)

	(1)	(2)	(3)	(4)	(5)	(6)
	Contract Choice		Effort Choice (A)		Effort Choice (B)	
	Voting	Leader	Voting	Leader	Voting	Leader
Choose Contract B			-0.229 (0.693)	-0.339 (0.421)	-1.306 (1.003)	1.194 (0.776)
Self chooses B × Other Chooses B			0.000 (.)		1.585** (0.634)	
Self Chooses B × Selected Leader				0.000 (.)		0.174 (0.143)
Choose Contract B_lag	0.675*** (0.068)	0.782*** (0.039)	-0.310 (0.520)	-0.638 (0.458)	1.543** (0.704)	1.192*** (0.441)
Contract B_lag	0.199*** (0.054)	0.067* (0.040)	-0.744 (0.714)	0.475 (0.532)	1.607*** (0.500)	0.417 (0.343)
Fail to meet target_lag	-0.212*** (0.078)	-0.186*** (0.048)	1.062 (0.822)	-0.904 (0.641)	-1.955** (0.785)	-1.528** (0.624)
Payoff_lag	0.000 (0.001)	-0.002*** (0.001)	0.005 (0.005)	0.012 (0.010)	-0.004 (0.012)	0.005 (0.008)
Constant	-0.089 (0.098)	0.235*** (0.081)	5.590*** (0.977)	3.485*** (0.795)	5.279*** (0.937)	6.192*** (0.946)
Periods	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No
<i>N</i>	450	450	140	110	310	340
<i>R</i> <sup>2</sup>	0.687	0.702	0.101	0.171	0.383	0.395

Notes: OLS estimates. Dependent variable: contract choice (1-2), effort choice (3-6). “Choose Contract B” indicates whether a subject chooses Contract B in the current period. Both choose B “Self chooses B × Other Chooses B” indicates whether both players choose Contract B in the current period. “Self Chooses B × Selected Leader” indicates whether a subject chooses B and is selected as the leader in the current period. “Choose Contract B\_lag” indicates whether a subject chooses Contract B in the previous period. “Contract B\_lag” indicates whether a subject experiences Contract B in the previous period. “Fail to meet target\_lag” indicates whether a subject fails to meet the target level if Contract B is implemented. “Payoff\_lag” is the payoff a subject receives in the previous period. “Periods” are controlled using period dummy variables. Robust standard errors in parentheses, fixed effects at individual level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

Table 12. Effort choices under Contract B (periods 26-30)

	(1)	(2)	(3)	(4)	(5)	(6)
	Contract Choice		Effort Choice (A)		Effort Choice (B)	
	Voting	Leader	Voting	Leader	Voting	Leader
Choose Contract B			0.276 (0.684)	-0.546 (0.623)	-0.919 (0.710)	0.106 (0.680)
Self chooses B × Other Chooses B			0.000 (.)		3.043*** (0.563)	
Self Chooses B × Selected Leader				0.000 (.)		0.046 (0.216)
Choose Contract B_lag	0.849*** (0.050)	0.678*** (0.066)	-0.840 (0.740)	-0.598 (0.520)	0.799 (0.613)	0.785 (0.539)
Contract B_lag	0.056 (0.038)	0.081 (0.049)	-0.020 (0.899)	-0.076 (0.847)	1.426*** (0.442)	1.558*** (0.541)
Fail to meet target_lag	-0.116** (0.055)	-0.217*** (0.069)	0.369 (0.906)	0.665 (1.022)	-3.034*** (0.712)	-3.138*** (0.682)
Payoff_lag	0.000 (0.000)	-0.000 (0.001)	0.006 (0.006)	0.014 (0.013)	-0.017** (0.008)	-0.003 (0.009)
Constant	0.015 (0.051)	0.189* (0.099)	4.319*** (0.856)	4.090*** (0.888)	6.018*** (0.827)	6.513*** (0.926)
Periods	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No
<i>N</i>	450	450	122	82	328	368
<i>R</i> <sup>2</sup>	0.812	0.565	0.075	0.127	0.560	0.340

Notes: OLS estimates. Dependent variable: contract choice (1-2), effort choice (3-6). “Choose Contract B” indicates whether a subject chooses Contract B in the current period. Both choose B “Self chooses B × Other Chooses B” indicates whether both players choose Contract B in the current period. “Self Chooses B × Selected Leader” indicates whether a subject chooses B and is selected as the leader in the current period. “Choose Contract B\_lag” indicates whether a subject chooses Contract B in the previous period. “Contract B\_lag” indicates whether a subject experiences Contract B in the previous period. “Fail to meet target\_lag” indicates whether a subject fails to meet the target level if Contract B is implemented. “Payoff\_lag” is the payoff a subject receives in the previous period. “Periods” are controlled using period dummy variables. Robust standard errors in parentheses, fixed effects at individual level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

## 4 Conclusion

In this study, we experimentally investigate the dominated contract in team production. We find that when the dominated contract is imposed exogenously, it successfully increases the team output to an almost efficient level. When given the opportunity to voluntarily decide whether to implement such a contract, subjects choose it frequently, indicating that they expect this mechanism to be effective *ex ante*. Compared to a voting system, subjects are more likely to choose the dominated contract in a leadership system. When the dominated contract is implemented under the two endogenous systems, teams also manage to increase their efforts, but no more than when the contract is exogenously imposed. Finally, we find that providing subjects with information about their opponents' contract choices may hurt productivity, as team members tend to exert lower effort levels after learning that their opponents do not choose the dominated contract.

Our study adds to the literature on designing mechanisms to foster team cooperation, and on designing incentive contracts to improve workers' performance based on collective outcomes. The dominated contract mechanism is shown to be effective, regardless of how it is implemented. It also adds to the literature on comparisons between exogenous and endogenous institutions. Our findings suggest that the endogenously selected dominated contract does not necessarily outperform its exogenous counterpart. This is partially because the output level is already high when the dominated contract is exogenously implemented, and a future direction along this line involves investigating the robustness of the dominated contract under circumstances with more uncertainty so that the overall effect of the contract may not be as strong as that observed in this study. Lastly, our findings highlight the importance of information, and it remains an interesting question to explore the optimal provision of information when forming endogenous institutions.

## References

- Alchian, A. A., & Demsetz, H. (1972). Production, information costs, and economic organization. *American Economic Review*, 62(5), 777-795.
- Andreoni, J., & Gee, L. K. (2012). Gun for hire: Delegated enforcement and peer punishment in public goods provision. *Journal of Public Economics*, 96(11-12), 1036-1046.
- Bandiera, O., Barankay, I., & Rasul, I. (2013). Team incentives: Evidence from a firm level experiment. *Journal of the European Economic Association*, 11(5), 1079-1114.
- Bohnet, I., & Kübler, D. (2005). Compensating the cooperators: is sorting in the prisoner's dilemma possible? *Journal of Economic Behavior & Organization*, 56(1), 61-76.
- Cadsby, C. B., & Maynes, E. (1999). Voluntary provision of threshold public goods with continuous contributions: experimental evidence. *Journal of Public Economics*, 71(1), 53-73.
- Charness, G., & Kuhn, P. (2011). Lab labor: What can labor economists learn from the lab? *Handbook of Labor Economics*, 4, 229-330.
- Che, Y. K., & Yoo, S. W. (2001). Optimal incentives for teams. *American Economic Review*, 91(3), 525-541.
- Cooper, D. J., Ioannou, C. A., & Qi, S. (2018). Endogenous incentive contracts and efficient coordination. *Games and Economic Behavior*, 112, 78-97.
- Cumming, D. J., Leboeuf G., & Schwienbacher A (2020). Crowdfunding models: Keep-it-all vs. all-or-nothing. *Financial Management*, 49, 331-360.
- Dal Bó, E., Dal Bó, P., & Eyster, E. (2018). The demand for bad policy when voters underappreciate equilibrium effects. *The Review of Economic Studies*, 85(2), 964-998.
- Dal Bó, P., Foster, A., & Kamei, K. (2024). The democracy effect: A weights-based estimation strategy. *Journal of Economic Behavior & Organization*, 220, 31-45.
- Dal Bó, P., Foster, A., & Putterman, L. (2010). Institutions and behavior: Experimental evidence on the effects of democracy. *American Economic Review*, 100(5), 2205-29.
- Dannenberg, A., & Gallier, C. (2020). The choice of institutions to solve cooperation problems: a survey of experimental research. *Experimental Economics*, 1-34.

- Eckel, C. C., & Grossman, P. J. (2008). Forecasting risk attitudes: An experimental study using actual and forecast gamble choices. *Journal of Economic Behavior & Organization*, 68(1), 1-17.
- Fan, J., Kwasnica, A.M., & Thomas, D.J. (2018). Paying for teamwork: Supplier coordination with endogenously selected groups. *Production and Operations Management*, 27(6), 1089–1101.
- Fischbacher, U. (2007). z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental economics*, 10(2), 171-178.
- Freeman, R. B., Pan, X., Yang, X., & Ye, M. (2022). Team Incentives and Lower Ability Workers: An Experimental Study on Real-Effort Tasks (No. w30427). *National Bureau of Economic Research*.
- Friebel, G., Heinz, M., Krueger, M., & Zubanov, N. (2017). Team incentives and performance: Evidence from a retail chain. *American Economic Review*, 107(8), 2168-2203.
- Gallier, C. (2020). Democracy and compliance in public goods games. *European Economic Review*, 121, 103346.
- Gallier, C., Langbein, J., & Vance, C. (2018). Non-binding Restrictions, Cooperation, and Coral Reef Protection: Experimental Evidence from Indonesian Fishing Communities. *Ecological Economics*, 150, 62-71.
- Grosse, S., Putterman, L., & Rockenbach, B. (2011). Monitoring in teams: Using laboratory experiments to study a theory of the firm. *Journal of the European Economic Association*, 9(4), 785-816.
- Gürerk, Ö., Irlenbusch, B., & Rockenbach, B. (2006). The competitive advantage of sanctioning institutions. *Science*, 312(5770), 108-111.
- Hamilton, B. H., Nickerson, J. A., & Owan, H. (2003). Team incentives and worker heterogeneity: An empirical analysis of the impact of teams on productivity and participation. *Journal of Political Economy*, 111(3), 465-497.
- Holmstrom, B. (1982). Moral hazard in teams. *The Bell Journal of Economics*, 324-340.
- Honhon, D., & Hyndman, K. (2020). Flexibility and reputation in repeated prisoner's dilemma games. *Management Science*, 66(11), 4998-5014.
- Hossain, T., & List, J. A. (2012). The behavioralist visits the factory: Increasing productivity using simple framing manipulations. *Management Science*, 58(12), 2151-2167.

- Hyndman, K., & Honhon, D. (2020). Flexibility in long-term relationships: An experimental study. *Manufacturing & Service Operations Management*, 22(2), 273-291.
- Kamei, K., Putterman, L., & Tyran, J. R. (2015). State or nature? Endogenous formal versus informal sanctions in the voluntary provision of public goods. *Experimental economics*, 18(1), 38-65.
- Kandel, E., & Lazear, E. P. (1992). Peer pressure and partnerships. *Journal of Political Economy*, 100(4), 801-817.
- Kocher, M. G., Martinsson, P., Persson, E., & Wang, X. (2016). Is there a hidden cost of imposing a minimum contribution level for public good contributions? *Journal of Economic Psychology*, 56, 74-84.
- Kosfeld, M., Okada, A., & Riedl, A. (2009). Institution formation in public goods games. *American Economic Review*, 99(4), 1335-55.
- Lazear, E. P., & Rosen, S. (1981). Rank-order tournaments as optimum labor contracts. *Journal of Political Economy*, 89(5), 841-864.
- Liu, M., & van der Heijden, E. (2019). Majority rule or dictatorship? The role of collective-choice rules in resolving social dilemmas with endogenous institutions. *Working Paper*.
- Markussen, T., Putterman, L., & Tyran, J. R. (2014). Self-organization for collective action: An experimental study of voting on sanction regimes. *Review of Economic Studies*, 81(1), 301-324.
- Martinsson, P., & Persson, E. (2019). Public Goods and Minimum Provision Levels: Does the institutional formation affect cooperation? *The Scandinavian Journal of Economics*, 121(4), 1473-1499.
- Nalbantian, H. R., & Schotter, A. (1997). Productivity under group incentives: An experimental study. *American Economic Review*, 314-341.
- Nyberg, A. J., Maltarich, M. A., Abdulsalam, D. D., Essman, S. M., & Cragun, O. (2018). Collective pay for performance: A cross-disciplinary review and meta-analysis. *Journal of Management*, 44(6), 2433-2472.
- Ostrom, E., Walker, J., & Gardner, R. (1992). Covenants with and without a sword: Self-governance is possible. *American Political Science Review*, 86, 404-417.
- Spraggon, J. (2002). Exogenous targeting instruments as a solution to group moral hazards. *Journal of Public Economics*, 84(3), 427-456.

Suleiman, R., & Rapoport, A. (1992). Provision of step-level public goods with continuous contribution. *Journal of Behavioral Decision Making*, 5, 133–153.

Sutter, M., Haigner, S., & Kocher, M. G. (2010). Choosing the carrot or the stick? Endogenous institutional choice in social dilemma situations. *The Review of Economic Studies*, 77(4), 1540-1566.

Sutter, M., & Weck-Hannemann, H. (2003). On the effects of asymmetric and endogenous taxation in experimental public goods games. *Economics Letters*, 79, 59-67.

Sutter, M., & Weck-Hannemann, H. (2004). An experimental test of the public goods crowding out hypothesis when taxation is endogenous. *FinanzArchiv/Public Finance Analysis*, 94-110.

Tyran, J. R., & Feld, L. P. (2006). Achieving compliance when legal sanctions are non-deterrent. *The Scandinavian Journal of Economics*, 108(1), 135-156.

Vollan, B., Landmann, A., Zhou, Y., Hu, B., & Herrmann-Pillath, C. (2017). Cooperation and authoritarian values: An experimental study in China. *European Economic Review*, 93, 90-105.

## Online Appendices

### Appendix A Experimental Instructions

#### [All treatments]

Welcome to this experiment on decision-making. Please read the following instructions carefully.

During the experiment, please stay quiet and do not communicate with other participants in any means. If you have any question at any time, please raise your hand, and an experimenter will come and assist you privately. The experiment will last for about one hour.

This experiment is divided into three parts. In Part I and II, you are going to take part in an experiment in this room together with other participants. Each participant seat behind a private computer, and no one can ever know the identity of another. In Part III, you are going to conduct your decision-making independently with other participants. All decisions are made on the computer screen.

It is an anonymous experiment. Experimenters and other participants cannot link your name to your desk number, and thus will not know the identity of you or of other participants who made the specific decisions.

During the experiment, your earnings are denoted in points. Your earnings depend on your own choices and the choices of other participants. At the end of the experiment, your earnings will be converted to RMB at the rate: 12 points = ¥ 1.

In addition, you receive 15 RMB show-up fee. Your total earnings will be paid to you in cash privately.

#### [Part 1]

In this part of the experiment, you will be allocated to a fixed group of six participants. In each round, the six participants will be randomly matched in pairs to conduct production activity. This production activity is going to repeat for 15 rounds. In each round, you will be re-matched to one of the other participants in your group, and the probability of matching each of them is identical. You will not be able to identify the partner you are matched with.

You will receive earnings in this production activity, and your earnings are determined as follows.

Output: The output of the production is determined by the input of you and your partner. You can choose an input number ranging from 0 to 20 (integers); a higher number is a higher input. You and your partner will choose the input simultaneously. You do not know the input of your partner when you choose your input; likewise, your partner does not know your input choice when he or she makes a choice. The final output is determined by both of your input:

Output =  $20 \times (\text{your input} + \text{your partner's input})$

Cost: During the production process, your cost of production is determined by your own input level. The higher your input level, the higher the cost. Your cost of production is determined as follows:

$$\text{Your cost} = \text{your input}^2$$

Your partner will face the same cost function. That is, when his or her input level is  $X$ , his or her cost is  $X^2$ .

Earnings: Your earnings are determined by the production output and your cost. You and your partner will share the output equally, and then deducted by the cost incurred. That is, your earnings in each production equals to half of the output minus your cost.

$$\text{Your earnings} = \frac{1}{2} \times \text{output} - \text{your cost}$$

Your partner's earnings are determined in the same way, that is:

$$\text{Your partner's earnings} = \frac{1}{2} \times \text{output} - \text{your partner's cost}$$

When deciding your input level, a calculator will be available on your computer screen. You can input any (hypothetical) input level of you and your partner, and then the calculator will show you the corresponding output and your earnings.

Table of input and earnings: The table below shows the relationship between your earnings and your input, your partner's input. The vertical line is your input level, the horizontal line is your partner's input level, and the corresponding cell shows your earnings under these input levels.

	0	5	10	15	20
0	0	50	100	150	200
5	25	75	125	175	225
10	0	50	100	150	200
15	-75	-25	25	75	125
20	-200	-150	-100	-50	0

In this part, the production activity will be repeated for 15 rounds, and two rounds will be randomly selected for payment. The probability that each round is selected is identical. For example, suppose the computer randomly selected round 4 and round 9 for payment, then your payment from this part is the sum of your earnings in round 4 and round 9 (negative earnings will be counted as well).

### [Part 1 Baseline]

Now Part I is ended, and you are about to start Part II. In this part of the experiment, you are still allocated to the same group of six participants as in Part I. In each round, the six participants will be randomly matched in pairs to conduct production activity. This production activity is also going to repeat for 15 rounds. In each round, you will be re-matched to one of

the other participants in your group, and the probability of matching each of them is identical. You will not be able to identify the partner you are matched with.

You will receive earnings in this production activity, and your earnings are determined in a different way compared to Part I. The production function in Part II is called Contract B, and the production function in Part I is called Contract A.

Compared to Contract A, Contract B works as follows: when the output produced by you and your partner is lower than 400, your earnings equals to half of the output minus your cost, and deducted by an extra 35.

The detailed function of Contract B is presented below:

If your output is equal or above 400, your earnings equal to half of the output minus your cost.

If your output is lower than 400, your earnings equal to half of the output minus your cost, and deducted by 35.

$$\text{Your earnings} = \begin{cases} \frac{1}{2} \times \text{output} - \text{your cost}, & \text{output} \geq 400 \\ \frac{1}{2} \times \text{output} - \text{your cost} - 35, & \text{output} < 400 \end{cases}$$

Your partner's earnings are determined in the same way, except that the cost is his or her own cost.

Note that, in this new contract, output and cost is determined the same way as Part I.

At the end of each period, you will learn the output and your earnings in that period.

When deciding your input level, a calculator will be available on your computer screen. You can input any (hypothetical) input level of you and your partner, and then the calculator will show you the corresponding output and your earnings.

Table of input and earnings: The table below shows the relationship between your earnings and your input, your partner's input. The vertical line is your input level, the horizontal line is your partner's input level, and the corresponding cell shows your earnings under these input levels.

	0	5	10	15	20
0	-35	15	65	115	200
5	-10	40	90	175	225
10	-35	15	100	150	200
15	-110	-25	25	75	125
20	-200	-150	-100	-50	0

In this part, the production activity will be repeated for 15 rounds, and two rounds will be randomly selected for payment. The probability that each round is selected is identical. For example, suppose the computer randomly selected round 4 and round 9 for payment, then your payment from this part is the sum of your earnings in round 4 and round 9 (negative earnings will be counted as well).

## [Part II Voting/Leader]

Now Part I is ended, and you are about to start Part II. In this part of the experiment, you are still allocated to the same group of six participants as in Part I. In each round, the six participants will be randomly matched in pairs to conduct production activity. This production activity is also going to repeat for 15 rounds. In each round, you will be re-matched to one of the other participants in your group, and the probability of matching each of them is identical. You will not be able to identify the partner you are matched with.

In this part, you and your partner can choose between two different production contracts. Contract A is exactly the same as in Part I. Contract B is different compared to contract A, and it differs as follows: when the output produced by you and your partner is lower than 400, your earnings equals to half of the output minus your cost, and deducted by an extra 35.

The detailed functions of Contract A and B are presented below:

Contract A:

$$\text{Your earnings} = \frac{1}{2} \times \text{output} - \text{your cost}$$

Contract B:

If your output is equal or above 400, your earnings equal to half of the output minus your cost.

If your output is lower than 400, your earnings equal to half of the output minus your cost, and deducted by 35.

$$\text{Your earnings} = \begin{cases} \frac{1}{2} \times \text{output} - \text{your cost}, & \text{output} \geq 400 \\ \frac{1}{2} \times \text{output} - \text{your cost} - 35, & \text{output} < 400 \end{cases}$$

Your partner's earnings are determined in the same way, except that the cost is his or her own cost.

Note that, in this new contract, output and cost is determined the same way as Part I.

Table of input and earnings: The two tables below shows the relationship between your earnings and your input, your partner's input, under each contract, respectively. The vertical line is your input level, the horizontal line is your partner's input level, and the corresponding cell shows your earnings under these input levels.

Contract A

	0	5	10	15	20
0	0	50	100	150	200
5	25	75	125	175	225
10	0	50	100	150	200
15	-75	-25	25	75	125
20	-200	-150	-100	-50	0

Contract B

	0	5	10	15	20
0	-35	15	65	115	200
5	-10	40	90	175	225
10	-35	15	100	150	200
15	-110	-25	25	75	125
20	-200	-150	-100	-50	0

**[Voting]**

In each period, once you are randomly matched into pairs, you and your partner will choose a contract by voting. You do not know the vote of your partner when you cast your vote; likewise, your partner does not know your vote when he or she casts a vote.

Once you both finish voting, the voting results will determine which contract will be implemented in this period.

- If both you and your partner vote for contract A, contract A will be implemented.
- If both you and your partner vote for contract B, contract B will be implemented.
- If you and your partner vote differently, the computer will randomly pick a contract. That is, the probability of implementing contract A or contract B is 50% each.

Once you and your partner finish voting, both of you will be informed of the voting results and the contract implemented in this period. Your earnings will be determined by the contract implemented. In the next period, you and your partner in the next period will vote again, and the contract in the next period is determined by the voting results in that period.

At the end of each period, you will learn the output and your earnings in that period.

**[Leader]**

In each period, once you are randomly matched into pairs, you or your partner will be randomly selected as the leader in this period, each of you has a probability of 50% to be selected as the leader. The leader can choose the contract (contract A or contract B) by herself or himself.

The procedure takes the following steps:

- At the beginning of each period and after random re-matching, each participant indicates his or her intended contract choice (contract A or contract B), if he will be selected as the leader in his or her group.
- Computer randomly selects (with a probability of 50%) one participant in a pair as the leader.
- The previous contract choice of the leader will be implemented directly for this pair.
- Before conducting the production activity, both players in a pair will be informed of who is the leader, and the contract choice of the leader.
- In the next period, you and your partner in that period will indicate the contract choice again, and the leader will be randomly selected again. That is, the contract may be different in the next period.

At the end of each period, you will learn the output and your earnings in that period.

### **[Part III]**

Now you are about to start Part III. In this part, you will make two decisions. You will receive earnings from both of these decisions. Please select your favorite option according to your preferences.

#### **Part III Question 1**

Your earnings will depend on the outcome of a fair coin toss. Every option shows the amount in points you earn in case a head shows up or a tail shows up. The probability of head or tail equals to 50%, respectively. After you make a decision, the computer will randomly decides the outcome of the coin toss.

Your earnings in this part are denoted in points. Your earnings will be converted to RMB at the rate: 12 points = ¥ 1.

- Option 1: Head: 51 Tail: 0
- Option 2: Head: 45 Tail: 9
- Option 3: Head: 39 Tail: 12
- Option 4: Head: 33 Tail: 15
- Option 5: Head: 24 Tail: 18
- Option 6: Head: 21 Tail: 21

Please indicate which one of the six options above you prefer:

#### **Part III Question 2**

You can select one of the following seven options to determine your earnings. A refers to yourself, and B refers to a randomly matched participant in this room. In each option, “Amount A” refers to your own earnings, and “Amount B” refers to the earnings of the other participant matched with you. Note that, the participant matched with you in this part will not be anyone you have been matched with in Part I or Part II.

At the meantime, the participant matched with you will make the same decision as you do. In the end, only one of your decisions will be randomly selected to determine both of your earnings. If your decision is selected, then “Amount A” in your decision will be your earnings, and “Amount B” in your decision will be the other’s earnings. If the decision of the other is selected, then “Amount A” in his/her decision will be his/her earnings, and “Amount B” in his/her decision will be your earnings.

Your earnings in this part are denoted in points. Your earnings will be converted to RMB at the rate: 12 points = ¥ 1.

- Option 1: Amount A: 30 Amount B: 0
- Option 2: Amount A: 29 Amount B: 8
- Option 3: Amount A: 26 Amount B: 15
- Option 4: Amount A: 21 Amount B: 21
- Option 5: Amount A: 15 Amount B: 26
- Option 6: Amount A: 8 Amount B: 29
- Option 7: Amount A: 0 Amount B: 30

Please indicate which one of the seven options above you prefer:

### **[Questionnaire]**

Finally, please take your time to answer the following questions.

Birth year and month:

Gender (Male/Female):

Major of study:

Grade:

Are you a member of the Communist Youth League?

Are you a member of the Communist Party?

If not, do you plan to be a member of the Communist Party?

What is your strategy in Part 1? Please describe briefly.

[Baseline] What is your strategy in Part 2? Please describe briefly.

[Voting or Leader] What is your strategy in contract choice and effort choice? Please describe briefly.

## Appendix B Supplemental figures and tables

Figure B1. Average effort level (left panel) and payoff level (right panel) over time by treatments (Contract A and Contract B combined)

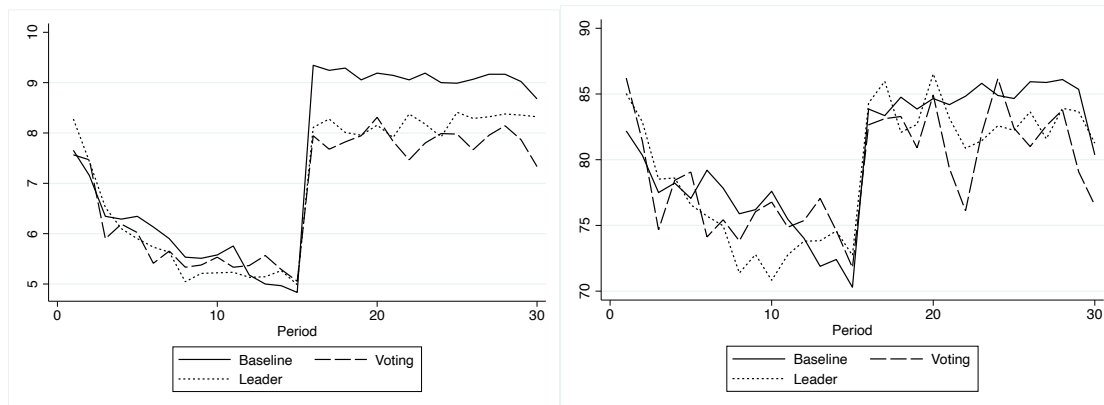


Table B1. Average effort and payoff level (Contract A and Contract B combined).

Condition	Periods	Baseline	Voting	Leader
Effort	1-15	5.88 (0.59)	5.80 (0.51)	5.79 (0.82)
	16-30	9.11 (1.39)	7.85 (1.52)	8.20 (1.18)
Payoff	1-15	76.41 (4.63)	76.64 (3.55)	75.67 (6.61)
	16-30	84.57 (19.32)	81.60 (13.57)	83.06 (12.85)

*Notes:* The average effort and payoff levels are calculated at the matching group level. Standard deviations are in parentheses.

Table B2. Effort choices under Contract B with control variables (periods 16-30)

	(1) Contract Choice		(3) Effort Choice (A)		(5) Effort Choice (B)	
	Voting	Leader	Voting	Leader	Voting	Leader
Choose Contract B			-0.235 (0.365)	-0.023 (0.342)	-0.092 (0.474)	0.698** (0.343)
Self chooses B × Other Chooses B			0.000 (.)		1.783*** (0.371)	
Self Chooses B × Selected Leader				0.000 (.)		0.048 (0.101)
Choose Contract B_lag	0.687*** (0.042)	0.692*** (0.031)	-0.204 (0.291)	-0.676* (0.357)	0.573 (0.357)	0.804*** (0.283)
Contract B_lag	0.144*** (0.035)	0.093*** (0.029)	-0.384 (0.384)	0.335 (0.384)	0.656** (0.275)	0.853*** (0.259)
Fail to meet target_lag	-0.159*** (0.048)	-0.229*** (0.037)	0.642 (0.486)	0.141 (0.437)	-1.746*** (0.468)	-2.053*** (0.380)
Payoff_lag	0.001 (0.001)	-0.001** (0.000)	0.007* (0.004)	0.009* (0.005)	-0.003 (0.006)	0.001 (0.005)
Risk averse	-0.034 (0.022)	0.006 (0.024)	0.099 (0.233)	-0.194 (0.444)	0.224 (0.217)	-0.259 (0.211)
Social	0.003 (0.022)	0.000 (0.021)	0.108 (0.191)	-0.357 (0.337)	0.404* (0.228)	-0.351 (0.223)
Female	0.003 (0.024)	0.005 (0.021)	0.115 (0.182)	-0.171 (0.422)	0.040 (0.219)	-0.331 (0.218)
Communist	-0.033 (0.044)	-0.018 (0.055)	-0.383 (0.498)	0.492 (0.771)	0.148 (0.303)	0.277 (0.406)
Communist_p lan	-0.012 (0.024)	-0.013 (0.022)	0.379* (0.200)	0.127 (0.387)	-0.022 (0.161)	-0.196 (0.211)
Unigrade=2	0.004 (0.031)	-0.035 (0.035)	0.124 (0.167)	0.000 (.)	1.079** (0.444)	-0.007 (0.259)
Unigrade=3	0.032 (0.030)	-0.035 (0.042)	-0.035 (0.354)	-1.288** (0.489)	1.031** (0.477)	-0.829* (0.437)
Unigrade=4	0.010 (0.045)	-0.020 (0.044)	0.428 (0.324)	0.446 (0.531)	0.227 (0.547)	0.050 (0.309)
Unigrade=5	0.029 (0.036)	0.014 (0.039)	-0.735 (0.868)	-0.416 (0.483)	1.611*** (0.424)	-0.292 (0.347)
Unigrade=6	0.012 (0.037)	0.006 (0.038)	0.256 (0.344)	-0.861 (0.651)	1.362*** (0.474)	-0.187 (0.398)
Period=18	0.005 (0.058)	0.035 (0.059)	-0.596* (0.354)	0.464 (0.370)	-0.360 (0.313)	-0.630** (0.282)
Period=19	-0.103* (0.056)	-0.014 (0.049)	-0.932** (0.396)	0.776* (0.428)	-0.481* (0.251)	-0.517** (0.217)
Period=20	-0.048 (0.054)	-0.027 (0.051)	-0.733* (0.426)	0.518 (0.413)	-0.197 (0.273)	0.145 (0.212)

Period=21	-0.072 (0.050)	0.027 (0.049)	-0.685 (0.510)	0.447 (0.368)	-0.940*** (0.326)	-0.626*** (0.208)
Period=22	-0.089 (0.054)	0.036 (0.047)	-1.029*** (0.354)	0.713* (0.359)	-0.825* (0.417)	-0.577** (0.224)
Period=23	-0.032 (0.052)	0.043 (0.045)	-0.991*** (0.369)	0.721 (0.509)	-0.474* (0.261)	-0.511** (0.230)
Period=24	-0.110** (0.046)	0.027 (0.038)	-0.470 (0.331)	-0.210 (0.400)	-0.512* (0.292)	-0.311 (0.189)
Period=25	-0.059 (0.052)	0.045 (0.039)	-0.265 (0.454)	0.785* (0.409)	-1.002*** (0.369)	-0.769*** (0.203)
Period=26	-0.075* (0.044)	0.053 (0.049)	-1.077** (0.407)	0.331 (0.500)	-0.926*** (0.287)	-0.574** (0.220)
Period=27	-0.052 (0.050)	0.053 (0.044)	-0.884** (0.394)	-0.229 (0.529)	-0.829** (0.333)	-0.879*** (0.268)
Period=28	-0.075 (0.048)	0.001 (0.045)	-0.739** (0.322)	0.475 (0.478)	-0.851*** (0.310)	-0.847*** (0.242)
Period=29	-0.069 (0.051)	0.026 (0.044)	-0.828*** (0.307)	0.047 (0.335)	-1.105*** (0.371)	-0.708*** (0.231)
Period=30	-0.099* (0.051)	0.023 (0.042)	-1.096*** (0.368)	0.864 (0.575)	-1.421*** (0.369)	-0.918*** (0.275)
Constant	0.052 (0.066)	0.211** (0.087)	5.136*** (0.604)	3.959*** (0.674)	5.962*** (0.619)	8.096*** (0.665)
<i>N</i>	1260	1260	384	306	876	954
<i>R</i> <sup>2</sup>	0.680	0.590	0.118	0.189	0.446	0.367

*Notes:* OLS estimates. Dependent variable: contract choice (1-2), effort choice (3-6). “Choose Contract B” indicates whether a subject chooses Contract B in the current period. Both choose B “Self chooses B × Other Chooses B” indicates whether both players choose Contract B in the current period. “Self Chooses B × Selected Leader” indicates whether a subject chooses B and is selected as the leader in the current period. “Choose Contract B\_lag” indicates whether a subject chooses Contract B in the previous period. “Contract B\_lag” indicates whether a subject experiences Contract B in the previous period. “Fail to meet target\_lag” indicates whether a subject fails to meet the target level if Contract B is implemented. “Payoff\_lag” is the payoff a subject receives in the previous period. “Risk averse =1” if choosing options 2-6 in Part III Q1. “Social=1” if choosing options 2-6 in Part III Q2. “Communist=1” if the participant is a member of the Communist Party of China (CPC), “Communist\_plan=1” if the participant plans to join the CPC. “Unigrade=1-6” and “Period=17-30” are dummy variables, indicating the grade of the participants, and the period of the game; “Unigrade=1” and “Period=17” are benchmark and are omitted. Observations are from periods 17–30; period 16 is not included because the main variables of prior periods are not available. Robust standard errors in parentheses, fixed effects at individual level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table B3. Effort choices under Contract B with control variables (periods 17-20)

	(1)	(2)	(3)	(4)	(5)	(6)
	Contract Choice		Effort Choice (A)		Effort Choice (B)	
	Voting	Leader	Voting	Leader	Voting	Leader
Choose Contract B			-0.201 (0.445)	0.612 (0.631)	0.736 (0.536)	0.728** (0.361)
Self chooses B × Other Chooses B			0.000 (.)		1.154** (0.477)	
Self Chooses B × Selected Leader				0.000 (.)		-0.135 (0.208)
Choose Contract B_lag	0.569*** (0.059)	0.604*** (0.053)	0.124 (0.467)	-0.362 (0.503)	-0.205 (0.338)	-0.000 (0.358)
Contract B_lag	0.153** (0.059)	0.141** (0.056)	-0.230 (0.444)	0.030 (0.409)	-0.031 (0.307)	0.921** (0.411)
Fail to meet target_lag	-0.150* (0.077)	-0.280*** (0.081)	0.558 (0.613)	0.168 (0.677)	-1.368** (0.637)	-1.637** (0.758)
Payoff_lag	0.001 (0.001)	-0.001 (0.001)	0.010* (0.006)	-0.000 (0.011)	-0.001 (0.007)	-0.003 (0.011)
Risk averse	-0.081* (0.042)	0.030 (0.038)	0.749** (0.331)	-0.733 (0.622)	0.052 (0.249)	-0.295 (0.193)
Social	-0.023 (0.042)	-0.035 (0.035)	0.556* (0.287)	-0.578 (0.491)	0.439* (0.258)	-0.080 (0.236)
Female	0.002 (0.045)	0.000 (0.036)	0.411 (0.370)	-0.064 (0.566)	0.227 (0.295)	0.025 (0.213)
Communist	-0.052 (0.083)	0.005 (0.090)	-1.075* (0.633)	1.220 (1.130)	0.188 (0.394)	0.528 (0.472)
Communist_Plan	-0.008 (0.046)	-0.065 (0.040)	0.388 (0.344)	-0.253 (0.500)	0.095 (0.259)	-0.452** (0.222)
Unigrade=2	0.002 (0.062)	-0.145*** (0.054)	0.676 (0.527)	0.000 (.)	1.543** (0.677)	0.204 (0.284)
Unigrade=3	0.048 (0.067)	-0.125** (0.063)	0.701 (0.555)	-1.334** (0.611)	1.718*** (0.627)	-0.491 (0.367)
Unigrade=4	0.010 (0.086)	-0.089 (0.067)	1.362** (0.678)	1.096 (0.925)	0.924 (0.776)	0.210 (0.301)
Unigrade=5	0.056 (0.074)	-0.003 (0.061)	-0.326 (1.257)	-0.821 (0.799)	2.110*** (0.611)	0.077 (0.461)
Unigrade=6	0.057	-0.080	1.090		2.003***	0.283

	(0.075)	(0.072)	(0.791)		(0.643)	(0.427)
Period=18	0.020 (0.055)	0.033 (0.058)	-0.595 (0.358)	0.045 (0.335)	-0.171 (0.291)	-0.564** (0.282)
Period=19	-0.076 (0.052)	-0.010 (0.050)	-0.971** (0.390)	0.578 (0.392)	-0.136 (0.255)	-0.441* (0.243)
Period=20	-0.025 (0.052)	-0.023 (0.052)	-0.735* (0.438)	0.153 (0.385)	0.091 (0.232)	0.240 (0.198)
Constant	0.112 (0.124)	0.357*** (0.131)	3.086*** (1.118)	5.714*** (1.273)	6.388*** (0.909)	8.539*** (0.886)
<i>N</i>	360	360	122	114	238	246
<i>R</i> <sup>2</sup>	0.547	0.503	0.207	0.238	0.433	0.290

*Notes:* OLS estimates. Dependent variable: contract choice (1-2), effort choice (3-6). “Choose Contract B” indicates whether a subject chooses Contract B in the current period. Both choose B “Self chooses B × Other Chooses B” indicates whether both players choose Contract B in the current period. “Self Chooses B × Selected Leader” indicates whether a subject chooses B and is selected as the leader in the current period. “Choose Contract B\_lag” indicates whether a subject chooses Contract B in the previous period. “Contract B\_lag” indicates whether a subject experiences Contract B in the previous period. “Fail to meet target\_lag” indicates whether a subject fails to meet the target level if Contract B is implemented. “Payoff\_lag” is the payoff a subject receives in the previous period. “Risk averse =1” if choosing options 2-6 in Part III Q1. “Social=1” if choosing options 2-6 in Part III Q2. “Communist=1” if the participant is a member of the Communist Party of China (CPC), “Communist\_plan=1” if the participant plans to join the CPC. “Unigrade=1-6” and “Period=17-20” are dummy variables, indicating the grade of the participants, and the period of the game; “Unigrade=1” and “Period=17” are benchmark and are omitted. Observations are from periods 17–20; period 16 is not included because the main variables of prior periods are not available. Robust standard errors in parentheses, fixed effects at individual level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table B4. Effort choices under Contract B with control variables (periods 21-25)

	(1)	(2)	(3)	(4)	(5)	(6)
	Contract Choice		Effort Choice (A)		Effort Choice (B)	
	Voting	Leader	Voting	Leader	Voting	Leader
Choose Contract B			0.024 (0.570)	-0.398 (0.500)	-0.974 (0.900)	1.155 (0.708)
Self chooses B × Other Chooses B			0.000 (.)		1.397** (0.582)	
Self Chooses B × Selected Leader				0.000 (.)		0.149 (0.145)
Choose Contract B_lag	0.653*** (0.072)	0.784*** (0.042)	-0.727* (0.434)	-0.515 (0.482)	1.598** (0.626)	1.294*** (0.408)
Contract B_lag	0.201*** (0.055)	0.066 (0.043)	-0.591 (0.620)	0.464 (0.563)	1.332*** (0.448)	0.258 (0.307)
Fail to meet target_lag	-0.214** (0.083)	-0.181*** (0.050)	0.714 (0.771)	-0.853 (0.692)	-1.620** (0.651)	-1.325*** (0.478)
Payoff_lag	0.000 (0.001)	-0.002*** (0.001)	0.005 (0.006)	0.013 (0.009)	-0.007 (0.010)	0.007 (0.007)
Risk averse	-0.051* (0.027)	-0.016 (0.031)	-0.569 (0.460)	0.433 (0.460)	0.643* (0.348)	-0.295 (0.301)
Social	-0.006 (0.025)	0.040 (0.028)	-0.071 (0.353)	-0.262 (0.438)	0.070 (0.381)	-0.357 (0.321)
Female	0.011 (0.026)	-0.005 (0.028)	-0.231 (0.311)	0.047 (0.551)	0.027 (0.322)	-0.487 (0.297)
Communist	-0.024 (0.041)	-0.014 (0.060)	-0.224 (0.829)	-0.058 (0.896)	-0.182 (0.492)	0.020 (0.434)
Communist_p lan	-0.021 (0.027)	0.010 (0.029)	0.778** (0.357)	0.255 (0.510)	0.055 (0.232)	-0.061 (0.258)
Unigrage=2	0.065 (0.098)	0.026 (0.043)	0.208 (0.246)	0.000 (.)	1.568*** (0.529)	0.071 (0.400)
Unigrage=3	0.101 (0.094)	0.013 (0.057)	0.626 (0.591)	-0.816 (0.524)	1.179* (0.647)	-0.934 (0.668)
Unigrage=4	0.075 (0.102)	0.005 (0.054)	0.345 (0.437)	0.237 (0.679)	0.690 (0.773)	0.109 (0.444)
Unigrage=5	0.090 (0.097)	-0.007 (0.062)	-1.089 (1.213)	0.637 (1.056)	1.632*** (0.607)	-0.360 (0.500)

Unigrade=6	0.061 (0.097)	0.064 (0.052)	0.007 (0.469)	-0.289 (0.697)	1.720*** (0.590)	-0.198 (0.602)
Period=22	-0.013 (0.049)	-0.001 (0.045)	-0.353 (0.422)	0.335 (0.407)	-0.059 (0.291)	0.024 (0.224)
Period=23	0.045 (0.036)	-0.002 (0.047)	-0.362 (0.447)	0.549 (0.487)	0.433* (0.222)	0.059 (0.243)
Period=24	-0.033 (0.036)	-0.017 (0.035)	0.140 (0.410)	-0.367 (0.377)	0.406* (0.230)	0.251 (0.208)
Period=25	0.013 (0.034)	0.005 (0.040)	0.290 (0.593)	0.552 (0.450)	-0.099 (0.246)	-0.157 (0.175)
Constant	-0.115 (0.147)	0.203* (0.103)	5.362*** (0.921)	3.234*** (0.847)	3.942*** (0.898)	7.100*** (0.900)
<i>N</i>	450	450	140	110	310	340
<i>R</i> <sup>2</sup>	0.693	0.705	0.212	0.247	0.430	0.456

*Notes:* OLS estimates. Dependent variable: contract choice (1-2), effort choice (3-6). “Choose Contract B” indicates whether a subject chooses Contract B in the current period. Both choose B “Self chooses B × Other Chooses B” indicates whether both players choose Contract B in the current period. “Self Chooses B × Selected Leader” indicates whether a subject chooses B and is selected as the leader in the current period. “Choose Contract B\_lag” indicates whether a subject chooses Contract B in the previous period. “Contract B\_lag” indicates whether a subject experiences Contract B in the previous period. “Fail to meet target\_lag” indicates whether a subject fails to meet the target level if Contract B is implemented. “Payoff\_lag” is the payoff a subject receives in the previous period. “Risk averse =1” if choosing options 2-6 in Part III Q1. “Social=1” if choosing option 2-6 in Part III Q2. “Communist=1” if the participant is a member of the Communist Party of China (CPC), “Communist\_plan=1” if the participant plans to join the CPC. “Unigrade=1-6” and “Period=21-25” are dummy variables, indicating the grade of the participants, and the period of the game; “Unigrade=1” and “Period=21” are benchmark and are omitted. Observations are from periods 21-25. Robust standard errors in parentheses, fixed effects at individual level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table B5. Effort choices under Contract B with control variables (periods 26-30)

	(1)	(2)	(3)	(4)	(5)	(6)
	Contract Choice		Effort Choice (A)		Effort Choice (B)	
	Voting	Leader	Voting	Leader	Voting	Leader
Choose Contract B			0.305 (0.623)	-0.261 (0.569)	-1.111 (0.691)	-0.020 (0.652)
Self chooses B × Other Chooses B			0.000 (.)		3.205*** (0.554)	
Self Chooses B × Selected Leader				0.000 (.)		0.052 (0.209)
Choose Contract B_lag	0.845*** (0.054)	0.674*** (0.067)	-0.852 (0.739)	-0.996* (0.540)	0.808 (0.571)	0.899* (0.511)
Contract B_lag	0.058 (0.045)	0.078 (0.049)	0.013 (0.953)	-0.186 (0.878)	1.039** (0.396)	1.420*** (0.502)
Fail to meet target_lag	-0.110* (0.061)	-0.213*** (0.070)	0.529 (0.926)	1.405 (1.042)	-2.621*** (0.543)	-2.888*** (0.710)
Payoff_lag	0.000 (0.001)	-0.000 (0.001)	0.007 (0.007)	0.019 (0.012)	-0.014** (0.006)	-0.003 (0.008)
Risk averse	0.002 (0.021)	-0.006 (0.029)	0.010 (0.280)	-0.913 (0.757)	-0.213 (0.200)	-0.265 (0.324)
Social	0.016 (0.017)	-0.015 (0.027)	-0.216 (0.259)	-0.029 (0.634)	0.738*** (0.225)	-0.599* (0.303)
Female	-0.009 (0.019)	0.015 (0.025)	0.228 (0.233)	-0.912 (0.675)	-0.060 (0.216)	-0.351 (0.269)
Communist	-0.014 (0.034)	-0.038 (0.068)	0.065 (0.575)	0.303 (0.939)	0.604* (0.324)	0.561 (0.598)
Communist_Plan	-0.015 (0.015)	0.006 (0.026)	0.053 (0.246)	0.462 (0.547)	-0.155 (0.197)	-0.213 (0.278)
Unigrade=2	-0.064 (0.050)	-0.005 (0.044)	-0.175 (0.150)	0.000 (.)	-0.196 (0.418)	-0.309 (0.364)
Unigrade=3	-0.060 (0.058)	-0.004 (0.051)	-1.164* (0.687)	-1.788** (0.754)	0.013 (0.440)	-1.142* (0.580)
Unigrade=4	-0.071 (0.057)	-0.002 (0.052)	0.246 (0.293)	0.279 (0.777)	-0.693 (0.472)	-0.203 (0.398)
Unigrade=5	-0.061	0.045	-0.086	-1.487	0.761*	-0.643

	(0.050)	(0.051)	(0.446)	(0.904)	(0.422)	(0.454)
Unigrade=6	-0.063 (0.052)	0.033 (0.046)	0.005 (0.415)	-2.421** (1.155)	0.104 (0.599)	-0.489 (0.487)
Period=27	0.021 (0.025)	-0.000 (0.049)	0.163 (0.494)	-0.427 (0.723)	0.050 (0.167)	-0.373 (0.284)
Period=28	-0.002 (0.032)	-0.050 (0.036)	0.282 (0.400)	0.031 (0.553)	-0.038 (0.216)	-0.379* (0.223)
Period=29	0.003 (0.033)	-0.028 (0.035)	0.216 (0.314)	0.038 (0.472)	-0.164 (0.226)	-0.188 (0.265)
Period=30	-0.027 (0.024)	-0.030 (0.035)	0.033 (0.428)	1.060 (0.746)	-0.599** (0.279)	-0.425 (0.302)
Constant	0.080 (0.058)	0.203* (0.118)	4.301*** (0.941)	4.673*** (1.007)	6.280*** (0.822)	8.003*** (0.988)
<i>N</i>	450	450	122	82	328	368
<i>R</i> <sup>2</sup>	0.813	0.567	0.172	0.323	0.599	0.388

*Notes:* OLS estimates. Dependent variable: contract choice (1-2), effort choice (3-6). “Choose Contract B” indicates whether a subject chooses Contract B in the current period. Both choose B “Self chooses B × Other Chooses B” indicates whether both players choose Contract B in the current period. “Self Chooses B × Selected Leader” indicates whether a subject chooses B and is selected as the leader in the current period. “Choose Contract B\_lag” indicates whether a subject chooses Contract B in the previous period. “Contract B\_lag” indicates whether a subject experiences Contract B in the previous period. “Fail to meet target\_lag” indicates whether a subject fails to meet the target level if Contract B is implemented. “Payoff\_lag” is the payoff a subject receives in the previous period. “Risk averse =1” if choosing options 2-6 in Part III Q1. “Social=1” if choosing options 2-6 in Part III Q2. “Communist=1” if the participant is a member of the Communist Party of China (CPC), “Communist\_plan=1” if the participant plans to join the CPC. “Unigrade=1-6” and “Period=26-30” are dummy variables, indicating the grade of the participants, and the period of the game; “Unigrade=1” and “Period=21” are benchmark and are omitted. Observations are from periods 26-30. Robust standard errors in parentheses, fixed effects at individual level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$