Supplementary Materials

S1: Experimental Instruction[1]

The study is conducted anonymously. Subjects will be identified only by code numbers. There is no communication allowed among the subjects. The experiment will last from 30 minutes to one hour. Please raise your hand if anything is unclear to you.

Experiment Structure

This experiment will consist of two independent stages. You will receive instructions for each stage on the screen before that stage begins. In each stage, you are playing in a group of 4 members (including yourself). For each stage, the group members are randomly selected and will NOT change during that stage. However, the groups will be reshuffled into new groups after the first stage.

Rule of Each Period

Please note that the experiment consists of two stages, and each stage has multiple periods. The following rule applies to every period:

In every period, you are assigned an endowment of 20 points, and asked to give a stated amount to a group pool. The stated amount may (or may not) change across periods. In each period you can decide whether not to give, or to give exactly that amount, but cannot give other amounts of points. You cannot know others' choices when you make your own decision. After each period, you will know whether all your group members (including yourself) have given the stated amount. But if not all of you have given, you will not know precisely how many members chose to give.

If all four members of your group (including yourself) give the stated amount, you will get twice that amount back (thus having a net return equaling that amount). But if not all of your group members give, you will NOT get any of your given points back and will thus end the period with only the points you did not give.

So, in each period, your earning will depend on the following cases:

[1] The original instruction is in Chinese. This is the instruction of the main experiment without belief elicitation.

Case 1: If all four members give the stated amount, then you earn: 20+that amount

Case 2: If you give, but not all other three members give, then you earn: 20-that amount

Case 3: If you do not give, no matter whether other members give or not, then you earn: 20

A special case of Case 3 is as follows:

- Case 4: If all four members do not give, then you earn 20 (each of four members earns 20)

Examples

Example 1: You are asked to give 10 points. You give, and all other group members also give. Then in this period each of you earns 20+10=30 points.

Example 2: You are asked to give 10 points. You give, two other group members also give, but the last one does not. Then in this period, each of you and the other two members earns 20-10=10 points, while the last member earns 20 points.

Example 3: You are asked to give 10 points. You do not give, but all three other group members give. Then in this period you earn 20 points, and each of the three other members earns 20-10=10 points.

We will have examinations on the computer to make sure you understand the rule. You can start the experiment only after you answer all questions correctly.

Payment

Your final payment for this experiment is the sum of two parts. The first is a show-up fee of about 400 points.[2] The second is a performance payment, i.e., the sum of your earnings from all periods in two stages. The conversion rate is 40 points = ¥1.00. All payments will be in cash.

At the end of the experiment, you will be asked to fill out a simple questionnaire. Then you can collect your earnings by presenting your code number to the supervisor. Your earnings will be in an envelope marked with your code number.

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[2] For the eight sessions without the "High Show-up Fee" treatment, the sentence reads, "The first is a show-up fee of 400 points."

S2: Subject' Survey Information and Randomization Check

Table S1: Summary Statistics of Subjects' Survey Information

Variable	Mean and Standard Deviation	Observations
Age	22.05 (3.25)	255
Male	0.41 (0.49)	255
Income	1.32 (1.38)	255
Family Income	5.63 (2.69)	189
Family Economic Status	2.60 (0.74)	254
Risk Aversion Index	4.47 (1.80)	250
Han nationality	0.91 (0.29)	255
Student	0.91 (0.29)	255
Concentration:		
Economics	0.12 (0.33)	241
Other Social Sciences	0.16 (0.37)	241
Business	0.27 (0.45)	241
Humanity	0.12 (0.33)	241
Science	0.15 (0.35)	241
Engineering	0.17 (0.38)	241
Medical/Health	0.01 (0.09)	241

Note: Income is a scale variable from 0 to 13, with higher value indicating higher income (0: no income; 1: annual income<5000 *yuan*; 13: annual income>160,000 *yuan*). Family income is a scale variable from 1 to 12, with higher value indicating higher income (1: annual income<5000 *yuan*; 12: annual income>200,000 *yuan*). Family economic status is coded in the following way: 1 (lower), 2 (lower middle), 3 (middle), 4 (upper middle), 5 (upper). Risk aversion index is a scale from 0 to 10, with a higher value approximately indicating higher risk aversion, and is measured as the number of lottery A chosen by the subject in our questionnaire.

Table S2: Comparison of Participants' Characteristics by Treatment

	Dependent Variable								
	Age	Male	Income	Family Economic Status	Risk Aversion Index	Han Nationality	Student	Economics Major	Business Major
	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(10)
Big Bang	-0.306	-0.042	-0.125	-0.083	0.474*	0.028	0.083*	0.026	0.006
	(0.612)	(0.081)	(0.241)	(0.123)	(0.279)	(0.046)	(0.046)	(0.056)	(0.078)
Semi-Gradulism	-0.278	0.076	-0.360	0.217*	0.424	0.013	0.055	-0.000	0.030
	(0.627)	(0.083)	(0.236)	(0.128)	(0.295)	(0.048)	(0.050)	(0.053)	(0.080)
High Show-up Fee	-0.111	0.086	0.056	-0.197	0.795**	-0.028	-0.050	0.053	-0.126
	(0.695)	(0.098)	(0.336)	(0.146)	(0.399)	(0.063)	(0.072)	(0.071)	(0.081)
Constant	22.236***	0.389***	1.444***	2.597***	4.097***	0.903***	0.875***	0.104***	0.284***
	(0.547)	(0.058)	(0.204)	(0.094)	(0.197)	(0.035)	(0.039)	(0.038)	(0.056)
Observations	255	255	255	254	250	255	255	241	241
R-squared	0.00	0.01	0.01	0.04	0.02	0.00	0.03	0.00	0.01

Note: Robust standard errors in parentheses. Gradualism treatment is the default category. * significant at 10%; ** significant at 5%; *** significant at 1%. See note in Table S1 for measures of variables.

S3: Technical Details for the Belief-Based Learning Model

Stage Game

I risk-neutral players play a coordination game with period-dependent stake level for N periods. In each period t, each player has a binary choice: they can choose to contribute with the amount of stake S_t ("C") or not to contribute at all ("NC"). The endowment per person in each period is E. The stake of the coordination task, $S_t (0 < S_t < E)$, may vary across periods. The value of the project output for every player is αS_t ($\alpha > 1$) if all I players contribute S_t, and zero otherwise. Let $A_{i,t}$ and $A_{j,t}$ be the actions of i and j at t, respectively, and $A_{-i,t}$ be the list of actions of all players except i. Thus, the payoff of player i in period t, denoted by $\pi_{i,t}$, is as follows:

$$\pi_{i,t}(A_{i,t}, A_{-i,t}) = \begin{cases} E + (\alpha - 1)S_t, & \text{if } A_{i,t} = C \text{ and } A_{j,t} = C, \forall j \neq i \\ E, & \text{if } A_{i,t} = NC \\ E - S_t, & \text{if } A_{i,t} = C \text{ and } \exists j \neq i, \text{ s.t. } A_{j,t} = NC \end{cases}$$

The stage game has two pure-strategy Nash equilibria: one payoff-dominant equilibrium with all players choosing C and one risk-dominant equilibrium with all choosing NC, as well as a mixed-strategy Nash equilibrium in which all players choose C with probability $\alpha^{-\frac{1}{I-1}}$.[3]

Belief Characterization and Updating

Assumption 1 (Belief on Strategy Type). In players' belief system, a player of strategy type X will contribute x for all $x \leq X$.

[3] The mixed-strategy equilibrium is determined by making every player indifferent between playing "to contribute" and "not to contribute", and this is mathematically equivalent to finding $p \in [0,1]$ such that $p^{I-1}(E + (\alpha - 1)S_t) + (1 - p^{I-1})(E - S_t) = E$, where p is the probability to play C. Solving this equation, we obtain $p = \alpha^{-\frac{1}{I-1}}$. Note that when $\alpha = 2, I = 4$ (as in our experimental setup), we have $p = 2^{-\frac{1}{3}}$. It is also worth noting that the mixed-strategy equilibrium is independent of the stake level due to the specific payoff structure of the coordination game we study.

Belief Characterization Method One (Individual Level):

In a typical player *i*'s mind, player *j*'s strategy type ($j \neq i$) is characterized by the highest level of contribution player *j* (unconditionally) chooses, denoted by X_j, where $X_j \geq 0$. Thus, player *i*'s belief about player *j*'s strategy type is a probability distribution of X_j, which can be characterized by a continuous and weakly increasing cumulative distribution function, $F_j^i(\cdot)$, where $F_j^i(0)=0$ and $\lim_{X \to +\infty} F_j^i(X)=1$.

Since the game is played anonymously and each player's strategy is not made known to other players, it is reasonable to assume that a player's belief is the same across all other players, and therefore we can simplify $F_{j,t}^i(\cdot)$ as $F_t^i(\cdot)$.

Assumption 2 (Anonymity of Belief). $\forall t = 1, \cdots, N$, $\forall i, j = 1, \cdots, I$, we have $F_{j,t}^i(\cdot) = F_t^i(\cdot)$ for $j \neq i$.

***Belief Characterization Method Two (Group Level)*:**

As we notice, when a player decides whether or not to contribute, what essentially matters is his/her belief about all other players' strategy types being no less than the stake level. Thus, in a period *t*, a player *i*'s belief on a contribution threshold X can also be characterized by his/her probability assessment that all other players' strategy type being at least X, denoted by $G_t^i(X)$, where $G_t^i(\cdot)$ is a weakly decreasing function with $G_t^i(0)=1$ and $\lim_{X \to +\infty} G_t^i(X)=0$.

Mathematically, these two characterization methods are equivalent as $G_t^i(X) = \prod_{j \neq i} (1 - F_{j,t}^i(X))$. However, by using method two to characterize players' beliefs at the group level instead of the individual level, the model becomes simpler without any loss of important information. Unless otherwise specified, method two is adopted to characterize the belief systems throughout the main body of the paper and the Supplementary Material.[4]

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[4] In an earlier version of the paper, we adopted method one to characterize players' beliefs. We are grateful to the associate editor for suggesting the appeal of using of method two.

Belief Updating

Player i's beliefs $G_t^i(\cdot)$ can be updated over time through observing the outcomes of the stage game in previous periods. According to the information feedback feature in the setting, after each period t, player i only knows whether or not all group members (including i) have contributed at t. There are in total three cases:

Case 1: i and all other group members contribute at t under stake level S_t, thus coordination succeeds. Then, i gets the feedback that all other group members have contributed. i updates his/her belief and believes that the contribution thresholds of all other group members are not smaller than S_t. Specifically, suppose at the beginning of period t player i's belief was $G_t^i(\cdot)$ over $[0,+\infty)$ and at period t all players contributed at the stake level S_t, then at the beginning of period $t+1$ player i's belief will become $G_{t+1}^i(\cdot)=G_t^i(\cdot)/G_t^i(S_t)$ over $[S_t,+\infty)$ according to the Bayes' rule.

Case 2: i contributes, but not all other group members have contributed at t, thus coordination fails. Then, i gets the feedback that not all other group members have contributed. i updates his/her belief and believes that at least one group member's contribution threshold is smaller than S_t. Therefore, at t+1 i believes that not all other group members will contribute for any $S_{t+1}\geq S_t$.

Case 3: i does not contribute at t, thus coordination fails. Then, i only gets the feedback that the group fails to coordinate but cannot know whether all other group members have contributed. i cannot update his/her belief about the minimum contribution threshold of all other group members.

Mechanisms

We now formally define three mechanisms: the Big-Bang mechanism, the Semi-Gradualism mechanism, and the Gradualism mechanism mechanisms. These three mechanism vary only in terms of the stake levels $S_t(t=1,\cdots,N)$ over periods, specified below, and we assume $S_1>0$, $l>0$, $1<N_1<N$, where $t=N_1+1$ is the first period for the stake to reach the highest level.

Big-Bang mechanism: $S_t^{BB}=S_1+N_1 l, t=1,\cdots,N$.

Semi-Gradualism mechanism: $S_t^{SG}=\begin{cases}S_1, & t=1,\cdots,N_1\\ S_1+N_1 l, & t=N_1+1,\cdots,N\end{cases}$

Gradualism mechanism: $S_t^G = \begin{cases} S_1 + (t-1)l, & t = 1,\cdots,N_1 \\ S_1 + N_1 l, & t = N_1+1,\cdots,N \end{cases}$

Clearly, we have $S_1^{SG} = S_1^G = S_1 \equiv \underline{S}$ and $S_t^{BB} = S_t^{SG} = S_t^G \equiv S_1 + N_1 l \equiv \overline{S}$ for all $t = N_1+1,\cdots,N$.

Main Results and Proofs

Lemma 1 (Optimal Behavior with Beliefs on Group Behavior). For a given period *t* with stake level S_t, player *i* chooses *C* if and only if he believes the probability of all other players' strategy type being at least S_t is no less than α^{-1} (namely, $G_t^i(S_t) \geq \alpha^{-1}$). Thus, in the symmetric belief case where every player has the same belief ($G_t^i(S_t){=}G_t(S_t)$), the equilibrium outcome is that every player contributes if $G_t(S_t) \geq \alpha^{-1}$ and no player contributes if $G_t(S_t) < \alpha^{-1}$.

Proof: Consider player *i*'s decision making process. Since every player's decision is made simultaneously and independently, if he/she chooses *C*, his/her excepted payoff is $EU_t^i(C) = G_t^i(S_t)\cdot(20+(\alpha-1)S_t)+(1-G_t^i(S_t))\cdot(20-S_t)$; If he/she chooses *NC*, his/her payoff is $EU_t^i(NC) = 20$. Comparing $EU_t^i(C)$ with $EU_t^i(NC)$, it is straightforward to derive $\alpha G_t^i(S_t) \geq 1$ if and only if $EU_t^i(C) \geq EU_t^i(NC)$, which is equivalent to

$$G_t^i(S_t) \geq \alpha^{-1} \text{ if and only if } EU_t^i(C) \geq EU_t^i(NC).$$

In the symmetric case where all players have the same beliefs, $G_t^i(S_t){=}G_t(S_t)$, the symmetric equilibrium can be derived immediately by applying each player's decision-making rule described above. *Q.E.D.*

If players' beliefs are at the level of individual behavior (characterized by method one), in which beliefs are characterized by $F_{j,t}^i(\cdot)$'s instead of $G_t^i(\cdot)$, where $G_t^i(X) = \prod_{j\neq i}(1-F_{j,t}^i(X))$, under Assumption 2, we can obtain Lemma 1'.

Lemma 1' (Optimal Behavior with Beliefs on Individual Behavior). For a given period t with stake level S_t, player i chooses C if and only if his belief satisfies $F_t^i(S_t) \le 1-\alpha^{-\frac{1}{I-1}}$. Thus, in the symmetric belief case where $F_t^i(S_t)=F_t(S_t)$ for every player i, the equilibrium outcome is that every player contributes if $F_t(S_t) \le 1-\alpha^{-\frac{1}{I-1}}$ and no player contributes if $F_t(S_t) > 1-\alpha^{-\frac{1}{I-1}}$.

Proof: By Assumption 2, $F_{j,t}^i(\cdot) = F_t^i(\cdot)$, thus we have $G_t^i(X) = \prod_{j \ne i}(1-F_{j,t}^i(X)) = (1-F_t^i(X))^{I-1}$. From Lemma 1, we know that player i chooses C if and only if $G_t^i(S_t) \ge \alpha^{-1}$, which is equivalent to $(1-F_t^i(S_t))^{I-1} \ge \alpha^{-1}$, or $F_t(S_t) \le 1-\alpha^{-\frac{1}{I-1}}$. In the symmetric case where all players have the same beliefs, the symmetric equilibrium can be derived immediately by applying each player's decision-making rule described above.

Q.E.D.

Proposition 1 (Initial Stake). The lower the stake at period 1, S_1, the higher the probabilities that each player will contribute and that the coordination will succeed at period 1.

Proof: Suppose $S_1' < S_1$. By the weak monotonicity feature of $G_t^i(\cdot)$, we have $G_1^i(S_1') \ge G_1^i(S_1)$, for all player i. By Lemma 1, it is straightforward that if player i chooses to contribute under the stake level S_1 (requiring $G_1^i(S_1) \ge \alpha^{-1}$), he will always do so under the stake level S_1' (since $G_1^i(S_1') \ge G_1^i(S_1) \ge \alpha^{-1}$). Therefore, the probability of each player contributing and that of successful coordination are higher under S_1' than under S_1. *Q.E.D.*

Proposition 2 (Persistence of Success/Failure). In two consecutive periods with the same stake $S_{t+1} = S_t$, a group will succeed in coordination at period t+1 when it succeeds at period t and will fail in coordination at period t+1 when it fails at period t.

Proof: Suppose that a group succeeds at period *t*, by Lemma 1 it must be the case that $G_t^i(S_t) \geq \alpha^{-1}$ for all players *i*. At the beginning of period *t+1*, every player updates his/her belief such that $G_{t+1}^i(S_t) = G_t^i(S_t) / G_t^i(S_t) = 1 \geq \alpha^{-1}$, and by Lemma 1 every player will contribute, resulting in successful coordination. Suppose instead that a group fails at period *t*, by Lemma 1 it must be the case that $G_t^i(S_t) < \alpha^{-1}$ for some player *i*. Given that at the next period this player *i* will not update his/her belief and will still not choose to contribute, the coordination will fail at period *t+1* as well. *Q.E.D.*

Proposition 3 (Quick vs. Slow Increase). Conditional on successful coordination at period *t*, for given S_t (Case a) or given S_{t+1} (Case b), the smaller the stake difference between period *t* and *t+1*, $S_{t+1} - S_t (> 0)$, the higher the probability that the coordination at period *t*+1 will succeed.

Proof: (a) Given S_t, suppose $S_t < S'_{t+1} < S_{t+1}$ and it suffices to show that conditional on successful coordination at period *t* with stake level S_t, if the coordination succeeds at period *t+1* with S_{t+1}, it will also succeed with S'_{t+1}. Given the successful coordination at period *t*, by Lemma 1 it must be the case that $G_t^i(S_t) \geq \alpha^{-1}$ for all players *i*. At the beginning of period *t+1*, every player updates his/her belief such that $G_{t+1}^i(S_{t+1}) = G_t^i(S_{t+1}) / G_t^i(S_t)$ and $G_{t+1}^i(S'_{t+1}) = G_t^i(S'_{t+1}) / G_t^i(S_t)$. Since $S'_{t+1} < S_{t+1}$, we have $G_{t+1}^i(S'_{t+1}) \geq G_{t+1}^i(S_{t+1})$ for all players *i*. Therefore, if the coordination succeeds at period *t+1* with S_{t+1} (by Lemma 1 $G_{t+1}^i(S_{t+1}) \geq \alpha^{-1}$), we must have $G_{t+1}^i(S'_{t+1}) \geq G_{t+1}^i(S_{t+1}) \geq \alpha^{-1}$, implying that the coordination will also succeed with S'_{t+1}.

(b) Given S_{t+1}, suppose $S_t < S'_t < S_{t+1}$ and it suffices to show that conditional on successful coordination at period *t*, if the coordination succeeds at period *t+1* with S_{t+1} when the stake level at period *t* was S_t, it will also succeed at period *t+1* with S_{t+1} when the stake level at period *t* was S'_t.

Given the successful coordination at period *t*, by Lemma 1 it must be the case that $G_t^i(S_t) \geq \alpha^{-1}$ for all player *i*. At the beginning of period *t+1*, every player updates his/her belief such that $G_{t+1}^i(S_{t+1}) = G_t^i(S_{t+1}) / G_t^i(S_t)$ and $G_{t+1}^i{}'(S_{t+1}) = G_t^i(S_{t+1}) / G_t^i(S_t')$. Since $S_t < S_t'$, we have $G_t^i(S_t) \geq G_t^i(S_t')$ for all player *i*, which implies $G_{t+1}^i{}'(S_{t+1}) \geq G_{t+1}^i(S_{t+1})$ Therefore, if the coordination succeeds at period *t+1* when the stake level at period *t* was S_t , (by Lemma 1 $G_{t+1}^i(S_{t+1}) \geq \alpha^{-1}$), we must have $G_{t+1}^i{}'(S_{t+1}) \geq G_{t+1}^i(S_{t+1}) \geq \alpha^{-1}$, implying that the coordination will also succeed at period *t+1* when the stake level at period *t* was S_t' . *Q.E.D.*

Proposition 4 (Performance Comparison). For any number of players ($I \geq 2$), for any multiplier ($\alpha > 1$), for any weakly decreasing belief functions ($G_1^i(\cdot), i = 1, \cdots, I$),

(a) Gradualism outperforms Semi-Gradualism; (b) Semi-Gradualism outperforms Big-Bang,

where mechanism A outperforms mechanism B if for period $t = N_1 + 1, \cdots, N$ where the stake level is $\bar{S}$, A succeeds in coordination whenever B succeeds in coordination.

Proof: (a) First, we show that Gradualism outperforms Semi-Gradualism. It suffices to show that Gradualism succeeds in coordination at period $t = N_1 + 1$ whenever Semi-Gradualism succeeds at period $t = N_1 + 1$. Suppose that Semi-Gradualism succeeds at period $t = N_1 + 1$, it must be the case by the previous analysis that Semi-Gradualism succeeds in coordination for all periods $t = 1, \cdots, N_1 + 1$. This implies (1) $G_{N_1+1}^i(S_{N_1+1}) = G_1^i(S_{N_1+1})) / G_1^i(S_1) \geq \alpha^{-1}$ and (2) $G_1^i(S_1) \geq \alpha^{-1}$, for all players *i*.

Note that (2) implies that Gradualism succeeds in coordination at period *t=1*. Given this, at the beginning of period *t=2*, each player updates his/her belief such that $G_2^i(S_2^G) = G_1^i(S_2^G) / G_1^i(S_1)$. Since $S_2^G < S_{N_1+1}$ implies $G_1^i(S_2^G)) / G_1^i(S_1) \geq G_1^i(S_{N_1+1})) / G_1^i(S_1)$, we have $G_2^i(S_2^G) \geq G_{N_1+1}^i(S_{N_1+1}) \geq \alpha^{-1}$, indicating that Gradualism succeeds in coordination at period *t=2*. Given this, at the beginning of period *t=3*, each player further updates his/her belief such that $G_3^i(S_3^G) = G_1^i(S_3^G) / G_1^i(S_2^G)$. Note that $S_3^G < S_{N_1+1}$ and $S_1 < S_2^G$, so we have $G_3^i(S_3^G) \geq G_N^i(S_{N_1+1}) \geq \alpha^{-1}$, again indicating that Gradualism succeeds in coordination at period *t=3*. A simple mathematical induction can show that given Gradualism succeeds in coordination at period *t*, it will also succeed in coordination at period *t+1*, therefore at period $t = N_1 + 1$, Gradualism will succeed in coordination.

(b) Second, we show that Semi-Gradualism outperforms Big-Bang. It suffices to show that Semi-Gradualism succeeds in coordination at period $t = N_1 + 1$ whenever Big-Bang succeeds at period $t = N_1 + 1$. Suppose that Big-Bang succeeds at period $t = N_1 + 1$, it must be the case that Big-Bang succeeds in coordination for all period $t = 1, \cdots, N_1 + 1$. This implies $G_1^i(S_{N_1+1}) \geq \alpha^{-1}$, for all players *i*.

Note that $G_1^i(S_1) \geq G_1^i(S_{N_1+1}) \geq \alpha^{-1}$ implies that Semi-Gradualism succeeds in coordination for all periods $t = 1, \cdots, N_1$. Given this, at the beginning of period $t = N_1 + 1$, each player updates his/her belief such that $G_{N_1+1}^i(S_{N_1+1}^{SG}) = G_1^i(S_{N_1+1}) / G_1^i(S_1)$. Note that $G_{N_1+1}^i(S_{N_1+1}^{SG}) = G_1^i(S_{N_1+1}) / G_1^i(S_1) \geq G_1^i(S_{N_1+1})$ and $G_1^i(S_{N_1+1}) \geq \alpha^{-1}$, we have $G_{N_1+1}^i(S_{N_1+1}^{SG}) \geq \alpha^{-1}$, indicating that Semi-Gradualism succeeds at period $t = N_1 + 1$. It is worth noting that when S_1 is very small, $G_1^i(S_1)$ can be very close to 1, so that the difference between $G_{N_1+1}^i(S_{N_1+1}^{SG})$ and $G_1^i(S_{N_1+1})$ can be close to 0.

Q.E.D.

Additional Results and Proofs

Proposition 5 (Number of Players). For a given mechanism, holding all other factors fixed, as the number of players I increases, the coordination success rate declines.

Proof: By Lemma 1', the coordination success rate depends on the comparison between each player i's belief $F_t^i(S_t)$ and $1-\alpha^{-\frac{1}{I-1}}$. As I increases, $1-\alpha^{-\frac{1}{I-1}}$ declines. Thus, it becomes more difficult for the inequality $F_t^i(S_t) \le 1-\alpha^{-\frac{1}{I-1}}$ to be satisfied for all players i, resulting in a lower coordination success rate. *Q.E.D.*

Proposition 6 (Multiplier). For a given mechanism, holding all other factors fixed, as the multiplier α increases, the coordination success rate rises.

Proof: By Lemma 1, the coordination success rate depends on the comparison between each player i's belief $G_t^i(S_t)$ and α^{-1}. As α increases, α^{-1} drops. Thus, it becomes less difficult for the inequality $G_t^i(S_t) \ge \alpha^{-1}$ to be satisfied for all player i, leading to a higher coordination success rate. *Q.E.D.*

Proposition 7 (Belief Function by Method Two). For a given mechanism, holding all other factors fixed, if $1-G_t^i(\cdot)$ first order stochastically dominates (FOSD) $1-(G_t^i)'(\cdot)$, then the coordination success rate is higher under $G_t^i(S_t)$ than under $(G_t^i)'(\cdot)$.

Proof: By Lemma 1, the coordination success rate depends on the comparison between each player i's belief and α^{-1}. $1-G_t^i(\cdot)$ FOSD $1-(G_t^i)'(\cdot)$ implies that $\forall S_t, G_t^i(S_t) \ge (G_t^i)'(S_t)$. Thus, the inequality $G_t^i(S_t) \ge \alpha^{-1}$ holds as long as $(G_t^i)'(S_t) \ge \alpha^{-1}$ is satisfied for player i, which means that the coordination success rate is higher under $G_t^i(S_t)$ than under $(G_t^i)'(\cdot)$. *Q.E.D.*

Proposition 7' (Belief Function by Method One). For a given mechanism, holding all other factors fixed, if $F_t^i(\cdot)$ first order stochastically dominates (FOSD) $(F_t^i)'(\cdot)$, then the coordination success rate is higher under $F_t^i(S_t)$ than under $(F_t^i)'(\cdot)$.

Proof: By Lemma 1', the coordination success rate depends on the comparison between each player *i*'s belief and $1-\alpha^{-\frac{1}{I-1}}$. $F_t^i(\cdot)$ FOSD $(F_t^i)'(\cdot)$ implies that $\forall S_t, F_t^i(S_t) \le (F_t^i)'(S_t)$. Thus, the inequality $F_t^i(S_t) \le 1-\alpha^{-\frac{1}{I-1}}$ holds as long as $(F_t^i)'(S_t) \le 1-\alpha^{-\frac{1}{I-1}}$ is satisfied for player *i*, which means that the coordination success rate is higher under $F_t^i(S_t)$ than under $(F_t^i)'(\cdot)$. *Q.E.D.*

Proposition 8 (Full Coordination). Given any number of players ($I \ge 2$), given any multiplier ($\alpha > 1$), given any continuous and strictly increasing belief functions ($F_1^i(\cdot), i = 1,\cdots,I$), for any $0 < \overline{S} < E$, there always exists a finite $N(\overline{S})$-period gradualism mechanism where the stake (not necessarily evenly) increases overtime such that the success of coordination is achieved with certainty.

Proof: We prove Proposition 8 by construction.

By Lemma 1, at period 1, the coordination is successful if and only if for all players *i*, $F_1^i(S_1) \le 1-\alpha^{-\frac{1}{I-1}}$. Since $I \ge 2$ and $\alpha > 1$, $1-\alpha^{-\frac{1}{I-1}}$ is a number strictly between 0 and 1. We choose the level of S_1^* such that $\max_i F_1^i(S_1^*) = 1-\alpha^{-\frac{1}{I-1}}$, and this is feasible as $F_t^i(\cdot)$'s are strictly increasing c.d.f. functions. If $S_1^* \ge \overline{S}$, we are done by setting $S_1 = \overline{S}$. If $S_1^* < \overline{S}$, we set $S_1 = S_1^*$ and move to the next step and construct S_2.

Next step we choose the level of S_2^* such that $\max_i F_2^i(S_2^*) \equiv \max_i \{1-(1-F_1^i(S_2^*))/(1-F_1^i(S_1))\} = 1-\alpha^{-\frac{1}{I-1}}$, and this is again feasible as $F_t^i(\cdot)$'s are strictly increasing c.d.f. functions. It is easy to show $S_2^* > S_1$. If $S_2^* \geq \overline{S}$, we are done by setting $S_2 = \overline{S}$. If $S_2^* < \overline{S}$, we set $S_1 = S_2^*$ and move to the next step and construct S_3 similarly.

In summary, the construction rule is to first choose S_{t+1}^* such that $\max_i F_{t+1}^i(S_{t+1}^*) \equiv \max_i \{1-(1-F_1^i(S_{t+1}^*))/(1-F_1^i(S_t))\} = 1-\alpha^{-\frac{1}{I-1}}$, then let $S_{t+1} = \min\{\overline{S}, S_{t+1}^*\}$, and move to the next step if $S_{t+1}^* < \overline{S}$. It is easy to show $S_{t+1}^* > S_t$. The only thing that needs to be proven is that there exists a finite $N(\overline{S})$ such that $S_{N(\overline{S})-1} < \overline{S} \leq S_{N(\overline{S})}^*$, which means that the above construction will stop within final steps.

Note that for all $S_t < \overline{S}$, $F_1^i(S_t) < F_1^i(\overline{S}) < 1$, and $0 < \alpha^{-\frac{1}{I-1}} < 1$. Thus by continuity and strict monotonicity of $F_t^i(\cdot)$, there exists $\delta > 0$ such that for all $S_t < \overline{S}$, $(1-F_1^i(S_{t+1}^*))/(1-F_1^i(S_t)) = \alpha^{-\frac{1}{I-1}}$ implies $S_{t+1}^* - S_t > \delta$. Therefore, $N(\overline{S})$ can be no more than $1+(\overline{S}-S_1)/\delta$. *Q.E.D.*

S4: Wealth Effect Does Not Drive Main Result in Stage 1

The different stake paths might yield potential earning differences and could potentially lead to a wealth effect across treatments. To isolate the potential wealth effect, we varied the show-up fee for treatments. The show-up fee provided to each subject for the three main treatments was 400 points, whereas that for the High Show-up Fee treatment was 480 points. The extra 80 points sufficiently captured the potential earning differences accumulated over Periods 1–6 (we discuss this in detail shortly); thus, this treatment enabled us to isolate the wealth effect by comparing the High Show-up Fee to the Big Bang treatment.[5]

Period 1 provides an ideal opportunity to examine the wealth effect because groups are randomly assigned and subjects have not yet interacted with each other. We do not detect a wealth effect in Period 1 induced by different show-up fees: No difference is observed in the contribution rate between the Big Bang and High Show-up Fee treatments (Figure 4). The difference in success rate in Period 1 between Big Bang and High Show-up Fee treatments is completely attributed to random factors in group assignment rather than a wealth effect.

Table 1 in the paper provides the summary of individual earnings accumulated over Periods 1–6 (excluding the show-up fee) for each treatment. On average, subjects in the Gradualism treatment earn the most through the first six periods, and the average (median) accumulated earnings from Period 1 to Period 6 are 112.42 (106) points for the Big Bang, 126.31 (130) points for the Semi-Gradualism, and 143.94

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[5] The method to isolate the wealth effect in the present study differs from the popular method used in the experimental literature, which randomly selects one or several periods for payment. Although no consensus is reached on whether the wealth effect is a serious problem and whether this effect should be isolated in repeated games, we are concerned that adopting random payments may change the behaviors of some subjects: some may play more cautiously because the period(s) selected for pay fully determines their performance payments, others may play randomly or less seriously because not all periods count for payments. Our alternative method, which varies the show-up fee, avoids this concern: comparing the performance under different show-up fees can test the wealth effect associated with the show-up fee. Of course, such a method has its limitation: The potential wealth effect of the show-up fee, which subjects may consider to be a "sunk benefit," may differ from the wealth effect of the performance earning accumulated across the earlier periods. To partially address this limitation, we denominate the show-up fee in points (versus in CNY), which has the same term and unit with the stake and accumulated performance earnings in the experiment.

(162) points for the Gradualism treatment. However, the differences in means (and medians) across treatments are dramatically smaller than 80 points (the difference in the show-up fee between the High Show-up Fee treatment and the other three treatments). This result demonstrates that a show-up fee difference of 80 points between the Big Bang and High Show-up Fee treatments is sufficient to capture the potential income differences at the beginning of Period 7 among Big Bang, Semi-Gradualism, and Gradualism treatments. In fact, when we add the show-up fee, the subjects in the Gradualism treatment, on average, earn less than the subjects in the High Show-up Fee treatment by the end of Period 6. Thus, because the Gradualism treatment results in better performance than the High Show-up Fee treatment in Periods 7–12 of Stage 1, a wealth effect from the first six periods cannot account for the difference in performance of the subsequent periods.

Moreover, by randomly assigning subjects into treatment groups, thus balancing wealth levels (outside the laboratory) across treatments, we rule out the possibility that the differences in performance are due to the differences in individual wealth levels from the real world.

For a more formal test, in Table S3 we report the marginal effects of probit regressions for Period 7, the first period for all treatment paths to encounter the highest stake, and control for the accumulated earnings. Column 1 confirms the difference in contribution rate in Period 7 across treatments as shown in Figure 4. Column 2 suggests that coordination success in the previous period has a large and positive effect on contribution decisions, which explain why Big Bang and High Show-up Fee treatments perform worse than Gradualism. Column 2 also show that conditional on coordination outcome in the previous period (i.e., Period 6), the Semi-gradualism treatment has a lower contribution rate than the Gradualism treatment, exactly reflecting Observation 3 in coordination dynamics, although the focus here is contribution decision, rather than success rate. Columns 3 and 4 suggest that accumulated earnings over Periods 1 to 6 cannot explain individual contribution decisions in Period 7, even when we also include the show-up fee. Thus, the key factor is whether the individual has experienced coordination success in the previous period, rather than the wealth effect.

Table S3: Effect of Treatments, Success in Previous Period and Accumulative Earning on Contribution Decision in Period 7 of the First Stage

	Contribution Dummy			
	(1)	(2)	(3)	(4)
Big Bang	-0.429***	-0.168*	-0.164	-0.164
	(0.123)	(0.101)	(0.102)	(0.102)
Semi-Gradualism	-0.064	-0.213*	-0.204	-0.204
	(0.132)	(0.119)	(0.128)	(0.128)
High Show-up Fee	-0.293*	-0.087	-0.085	-0.121
	(0.154)	(0.113)	(0.112)	(0.201)
Success in previous period		0.695***	0.680***	0.680***
		(0.058)	(0.099)	(0.099)
Accumulate earning over P1–P6			0.000	
			(0.002)	
Accumulate earning over P1–P6 plus show-up fee				0.000
				(0.002)
Observations	256	256	256	256

Note: Average marginal effects of probit regressions are reported. The default category is the Gradualism treatment. Robust standard errors in parentheses. Standard errors are all clustered at the group level. * significant at 10%; ** significant at 5%; *** significant at 1%.

S5: More Results Regarding the Impact of Previous Success/Failure

Table S4: Effect of Treatments, Success in Previous Period and Stake Increase on Contribution and Coordination Success (First Stage)

	Contribution Dummy			Success Dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
Big Bang	-0.407***	-0.102*	-0.032	-0.450***	-0.123	-0.083
	(0.106)	(0.059)	(0.058)	(0.112)	(0.076)	(0.098)
Semi-Gradualism	-0.108	-0.033	0.059	-0.145	-0.128*	0.0423
	(0.116)	(0.052)	(0.049)	(0.135)	(0.067)	(0.118)
High Show-up Fee	-0.329**	-0.104	-0.034	-0.316**	-0.071	-0.034
	(0.136)	(0.069)	(0.067)	(0.135)	(0.082)	(0.105)
Success in previous period		0.714***	0.720***		0.933***	0.951***
		(0.023)	(0.023)		(0.021)	(0.018)
△Stake Small (=2)			0.109***			0.039
			(0.030)			(0.108)
△Stake Large (=12)			-0.372***			-0.333***
			(0.135)			(0.033)
Observations	3,072	2,816	2,816	3,072	2,816	2,816

Note: Average marginal effects of probit regressions are reported. The default category is the Gradualism treatment. Robust standard errors in parentheses. Standard errors are all clustered at the group level. * significant at 10%; ** significant at 5%; *** significant at 1%.

Figure S1-1: Success Rate Conditional on Failure in t-1 (First Stage)

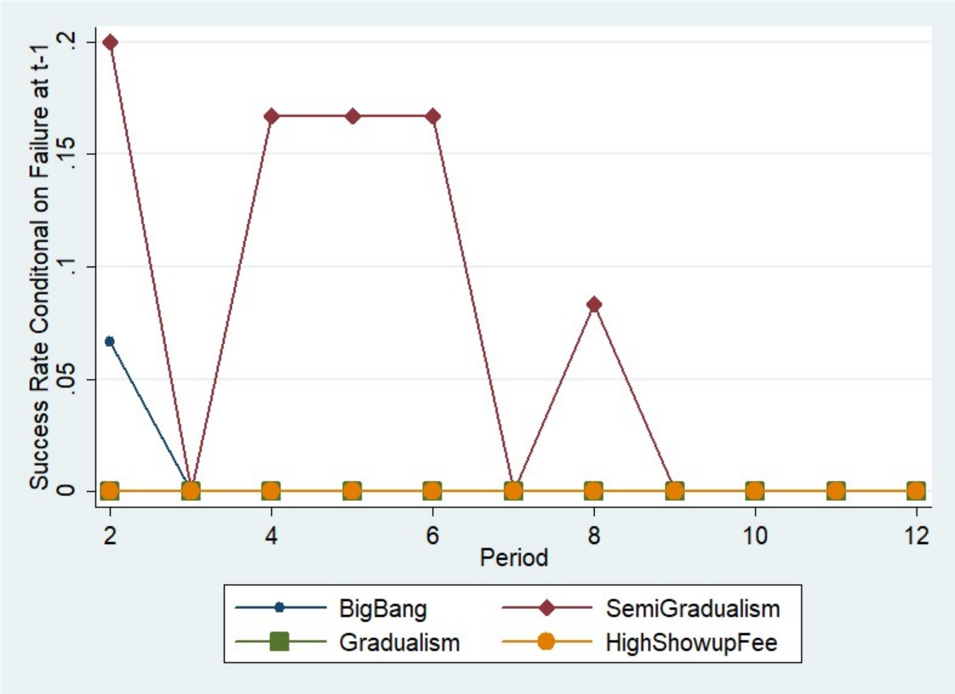


Figure S1-2: Success Rate Conditional on Success in t-1 (First Stage)

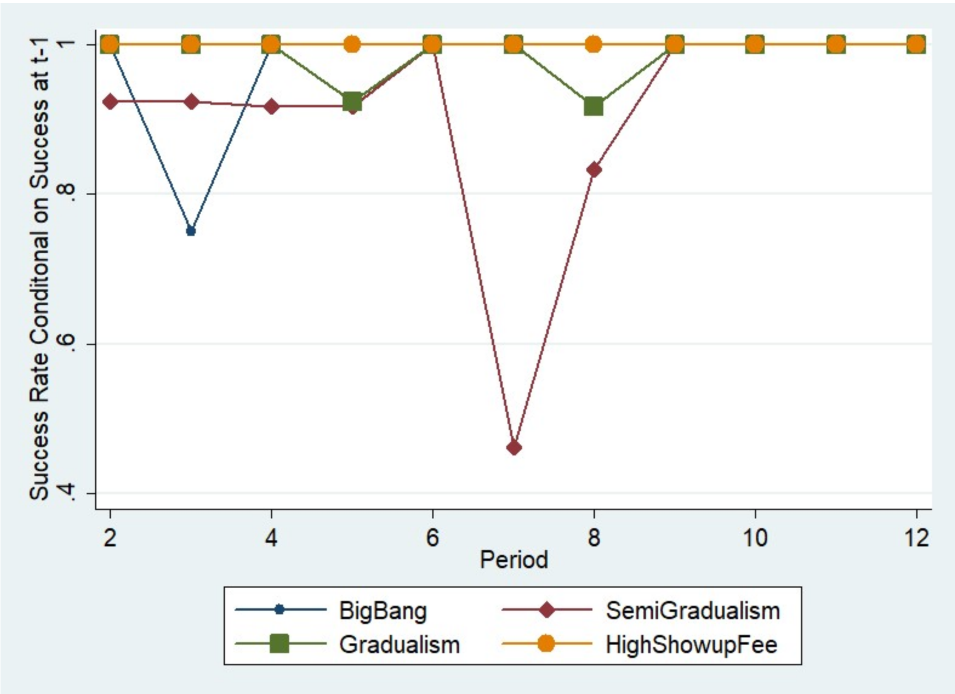


Figure S1-3: Success Rate Conditional on Failure in t-2 (First Stage)

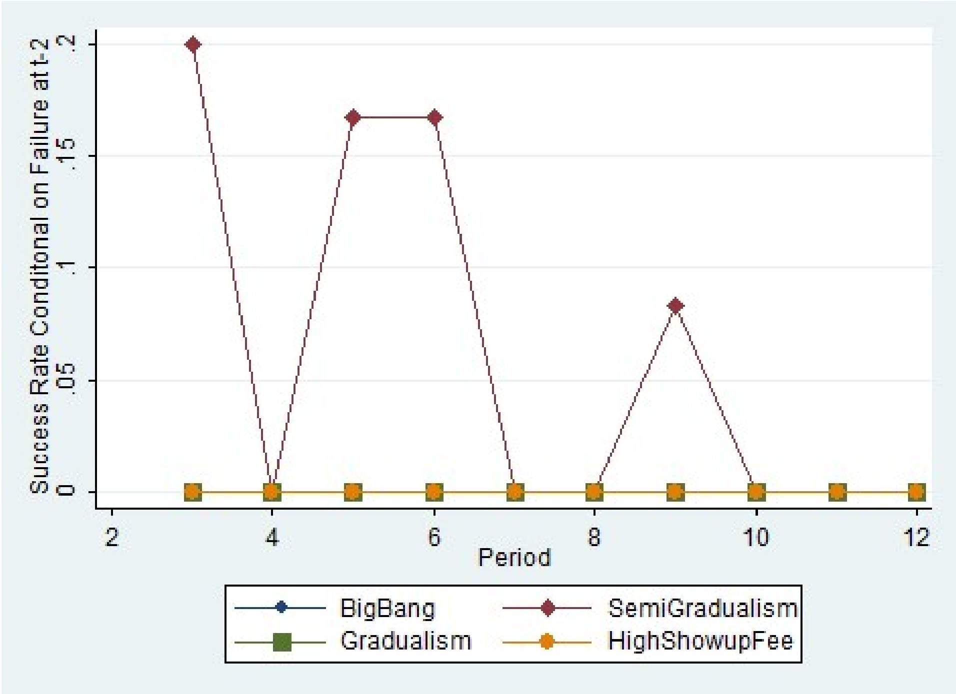


Figure S1-4: Success Rate Conditional on Success in t-2 (First Stage)

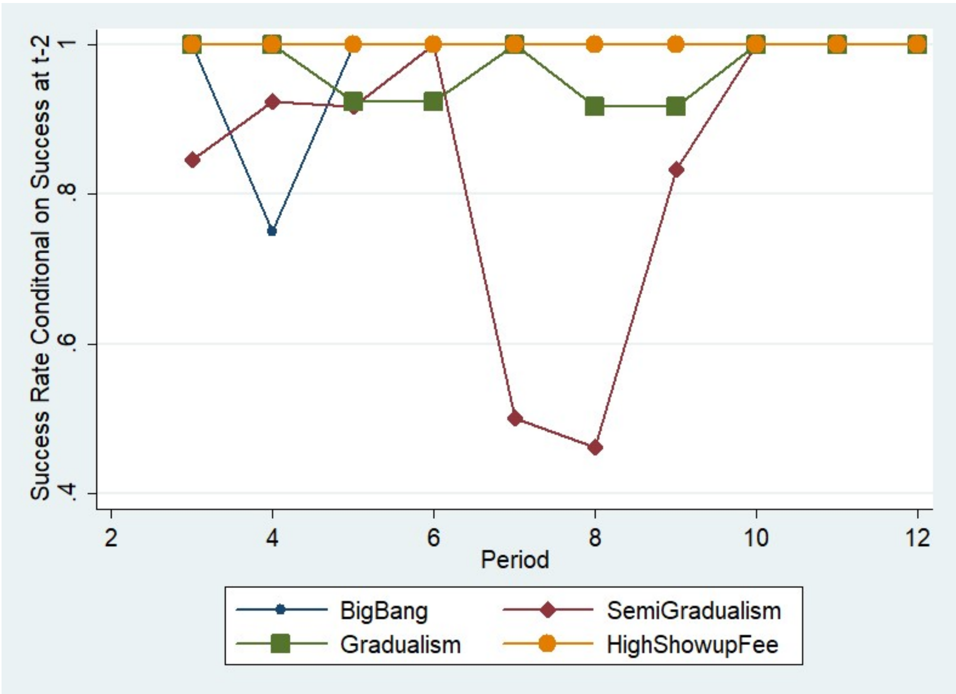


Figure S1-5: Success Rate Conditional on Failure in t-3 (First Stage)

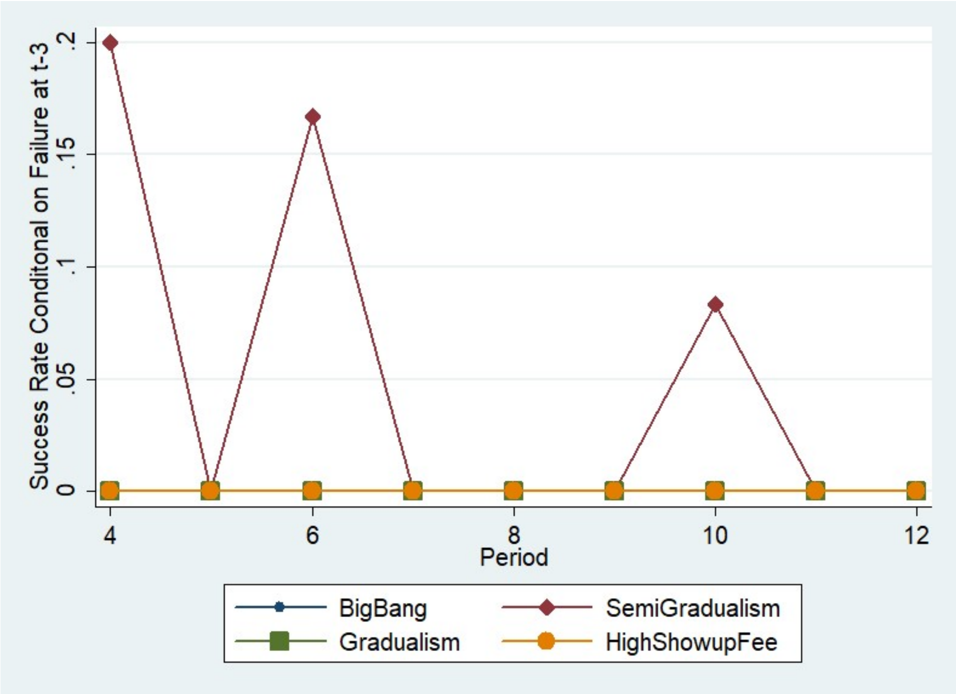


Figure S1-6: Success Rate Conditional on Success in t-3 (First Stage)

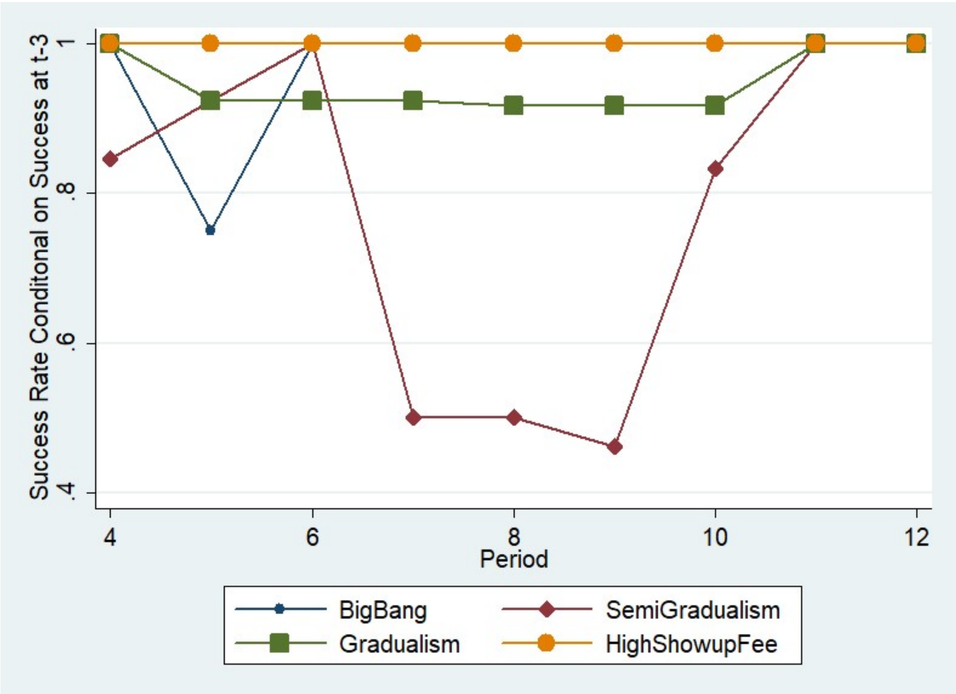
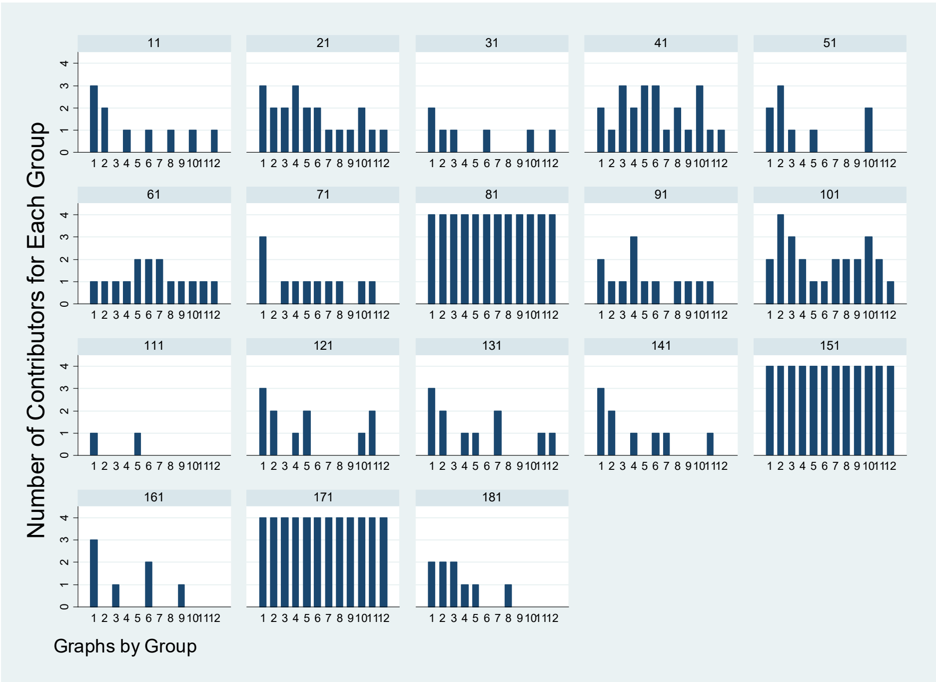
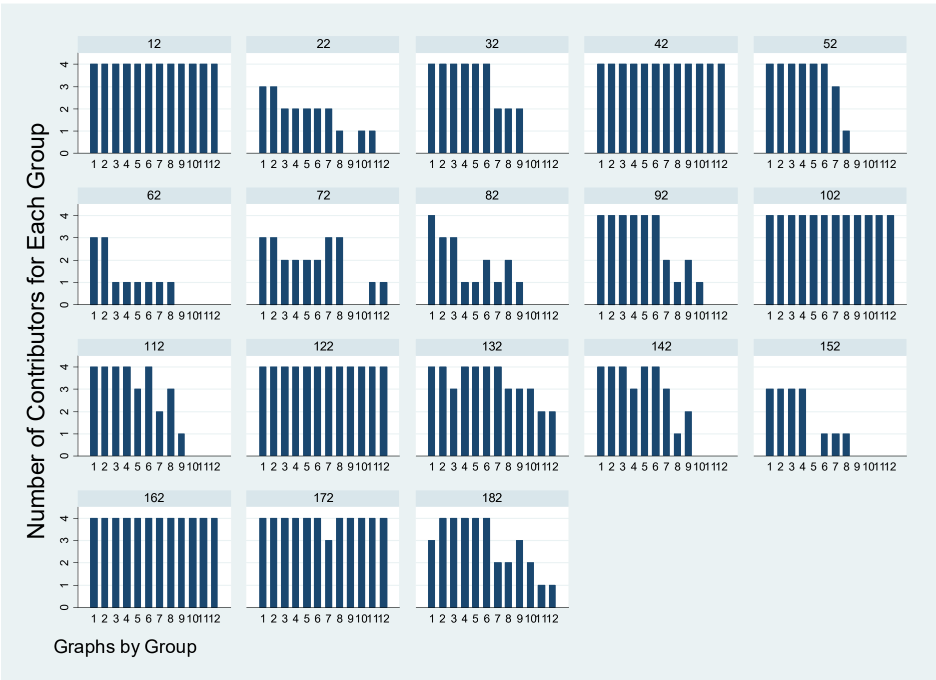


Figure S2: All Group Coordination Results by Treatment

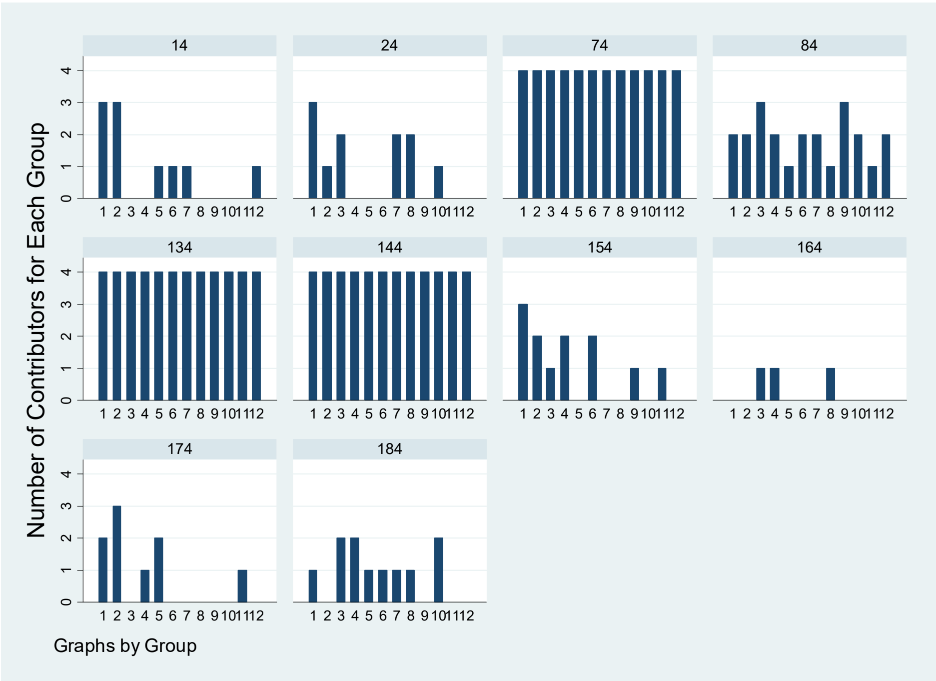


A: Big Bang Groups (each subgraph indicates a Big Bang group)



B: Semi-Gradualism Groups (each subgraph indicates a Semi-Gradualism group)

C: Gradualism Groups (each subgraph indicates a Gradualism group)



D: High Show-up Fee Groups (each subgraph indicates a High Show-up Fee group)

Note: For each group in each subgraph, the horizontal axis indicates the period, and the vertical axis indicates the number of contributors. The coordination is successful if and only if all four members contribute. Each group is identified by a code above its subgraph in the following way: the lowest digit indicates the treatment type (1=Big Bang, 2=Semi-Gradualism, 3=Gradualism, 4=High Show-up Fee); the highest one or two digits indicate the session number (1–18).

The graphs show three patterns:

a). Once a group fails to coordinate, it rarely becomes successful thereafter. Only six exceptions (one Big Bang group: group No.101; five Semi-Gradualism groups: groups No. 112, 132, 142, 172, 182) out of 64 groups exist.

b). Once a group succeeds in coordination, it almost always remains successful at the same stake. Only seven exceptions (one Big Bang group: group No.101; four Semi-Gradualism groups: groups No. 82, 112, 132, 142; and two Gradualism groups: groups No. 33, 173) exist.

c). For the Semi-Gradualism groups that encounter a big increase in stake from Period 6 to Period 7, previously successful coordination established at low-stake periods is sabotaged even if only one of the four group members stops contributing. Among the eight Semi-Gradualism groups in which the number of contributors decreases from Period 6 to Period 7, seven groups (groups No. 32, 52, 92, 112, 142, 172 and 182) are successful in Period 6 but fail in Period 7 due to one or two "betrayers" in each group, whereas only one group (group No. 82) already fails in Period 6.

S6: More Results in Stage 2

Considering that the Gradualism treatment has a higher success rate in the last period of the first stage, we hypothesize that the higher contribution rate at the beginning of Stage 2 of the subjects exposed to this treatment is the result of the higher success rate of the previous period (i.e., the last period of Stage 1). To test this, we regress the contribution decision in the first period of Stage 2 on the coordination result in the last period of Stage 1, and report the results in Column 2 of Table S5 below. The result confirms our hypothesis: The difference in the contribution rate in Period 1 of Stage 2 by success type in the last period of Stage 1 is large and highly significant. In Column 3, we control for the treatment dummy. The coefficient (or odds ratio) on the variable "success in previous period" does not change, whereas the coefficient on the treatment dummy becomes almost zero and statistically insignificant (and the odds ratio is insignificantly different from one). This result suggests that the treatment regime in the first stage of the experiment influences the contribution rate in the first period of Stage 2, mostly through the success rate in the last period of Stage 1.

Table S5: Contribution Decision in the First Period of the Second Stage (Firth Logit Regression)

	Odds Ratio [95% CI]	Odds Ratio [95% CI]	Odds Ratio [95% CI]
	(1)	(2)	(3)
Gradualism	2.115**		0.966
	[1.018, 4.394]		[0.419, 2.224]
Success in previous period		101.6***	100.8***
		[6.195, 1666.961]	[6.075, 1672.251]
Constant	2.814***	1.821***	1.825***
	[2.028, 3.906]	[1.323, 2.504]	[1.286, 2.590]
Observations	256	256	256

Note: Odds ratios and 95% confidence intervals using Firth logit regressions (Heinz & Schemper, 2002) are reported. The default category is three non-Gradualism treatments (Big Bang, Semi-Gradualism and High Show-up Fee) all together. * significant at 10%; ** significant at 5%; *** significant at 1%.

S7: Detailed Belief Elicitation Process in the Belief Elicitation Experiment

As mentioned in the paper, after each period, we elicit the belief of each subject about the number of contributors among the other three group members, N_C, in his/her group (note that the group size is four). We require each subject to report four probability values for the cases that N_C equals 0, 1, 2, and 3, respectively. These four probability values should range from 0 to 100 (included) and sum to 100.

To provide incentives for the subjects to report their true beliefs, we reward a subject 5 points for that period if he/she assigns his/her highest reported probability value to N_C.[6,7] In case of a tie (i.e., a subject assigns the same probability to n different numbers from 0 to 3 and one of the n numbers equals N_C), he/she receives the reward with a probability of $1/n$.[8]

Among the four probability values, the probability that N_C equals three is the most important and relevant because of the weakest-link payoff structure; we divide this probability by 100 and code it as the belief that all other three group members contribute, which ranges from 0 to 1.

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[6] For instance, a subject reports that the probabilities that N_C equals 0, 1, 2, and 3 are 10%, 20%, 40%, and 30%, respectively. This suggests that this subject believes that N_C is most likely to be 2 because 40%>30%>20%>10%. Then, if and only if it turns out that N_C equals 2, his/her guess is considered "right" and we reward him/her 5 points for that period.

[7] Among the four probability values a subject reports, only the highest probability determines a reward and is thus incentive-compatible. We choose to elicit all four probabilities because a full set of probabilities provide richer information. At the least, subjects have the incentive to report the most likely number of contributors. Thus, our method can elicit the belief same as if asking the subjects what the most likely number of contributors is. Although the other three probabilities we elicited are not incentive compatible and could be noisy, it provides more information. Thus, we have more freedom for data analysis and can decide how to use both the incentive-compatible and incentive-incompatible data.

[8] For instance, if a subject reports that the probabilities that N_C equals 0, 1, 2 and 3 are all 25%, then this subject receives the reward with a probability of one-fourth no matter how many group members contribute. In another example, a subject reports that the probabilities that N_C equals 0, 1, 2 and 3 are 10%, 30%, 30% and 30%, respectively; then he/she receives the reward with a probability of one-third if and only if N_C equals 1, 2 or 3.

S8: More Results in Belief Elicitation Sessions

Figure S3: Contribution Rate (Belief Elicitation Sessions, First Stage)

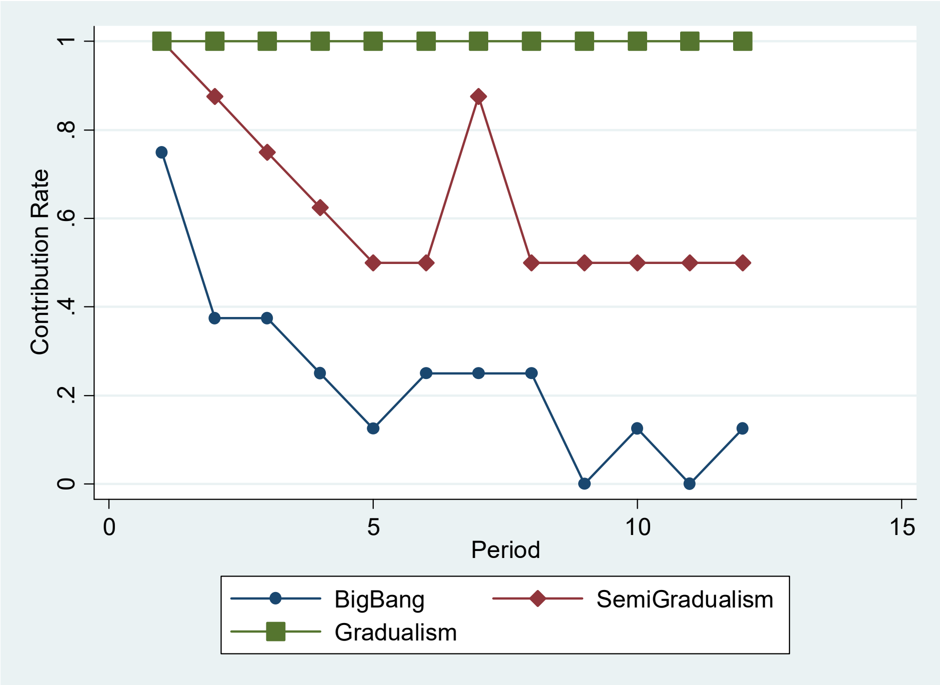

Figure S4: Success Rate (Belief Elicitation Sessions, First Stage)

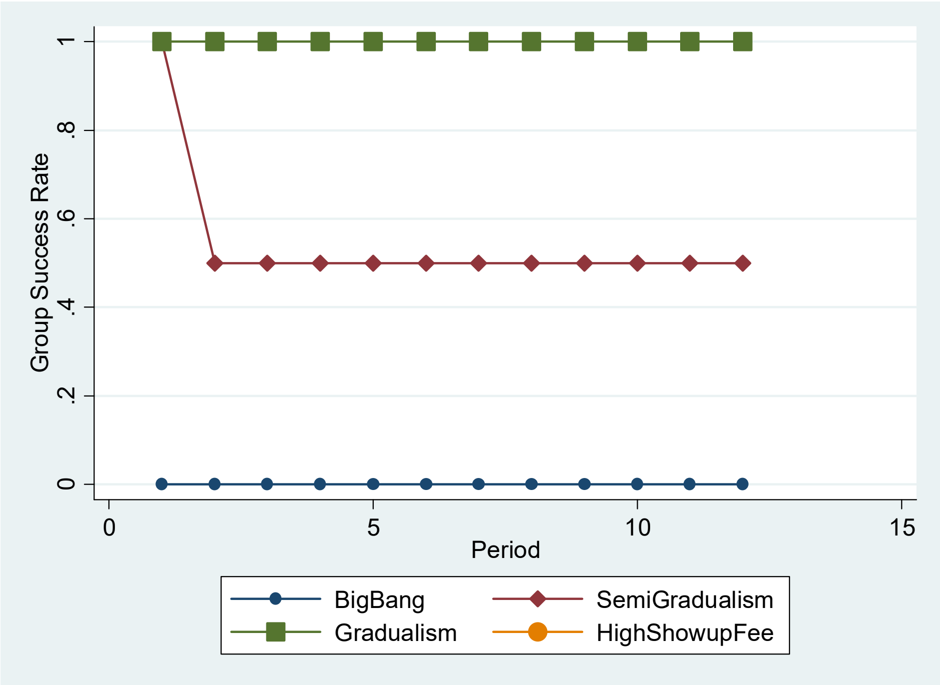

Figure S5: Average Individual Earning (Belief Elicitation Sessions, First Stage)

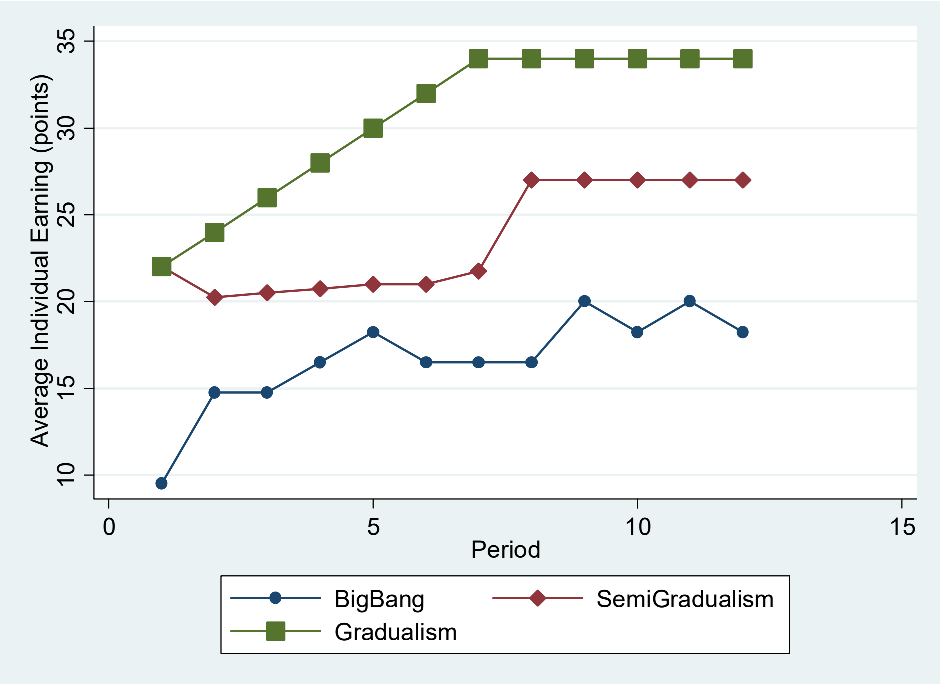

Table S6: The Effect of Belief on Contribution Decisions in Belief Elicitation Sessions (Firth Logit)

	Contribution Dummy				
	(1)	(2)	(3)	(4)	(5)
Belief that all other three contribute	8.832***	13.51***	15.25***	13.65***	11.82***
	(0.877)	(2.342)	(2.826)	(2.802)	(2.867)
Stake	-0.0771*	0.0125	0.157	0.178	0.175*
	(0.0459)	(0.0605)	(0.101)	(0.109)	(0.103)
Subject fixed effects	N	Y	Y	Y	Y
Period fixed effects	N	N	Y	Y	Y
Lagged contribution dummy				0.660	0.0833
				(0.649)	(0.709)
Lagged success dummy					2.377*
					(1.316)
Constant	-1.455**	-5.059***	-4.591**	-9.058***	-9.033**
	(0.630)	(1.410)	(1.850)	(2.851)	(3.607)
Observations	480	480	480	456	456

Note: Coefficients and standard errors (in parentheses) from the Firth logit regressions are reported. *** p<0.01, ** p<0.05, * p<0.1. Contribution is a dummy indicating whether the subject contributes in the current period. Belief ranges from 0 to 1 and represents the subject's belief that all other three group members contribute in the current period. Stake refers to the stake in the current period.