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Accepted for publication in the Journal of Economic Dynamics and Control

http://doi.org/10.1016/j.jedc.2026.105283

Redistribution, Growth, and Inequality: Insights from Experimental Dynamic Public Good Games

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February 4, 2026

Abstract

This paper investigates the interplay between income inequality, growth, and redistribution in a dynamic public good game. Redistribution, as expected, leads to lower inequality but it does not necessarily reduce growth. Especially in settings characterized by high initial inequality, a high tax rate can produce similar wealth levels as without taxation while reducing inequality. On average, we find that people tend to favor more redistribution over time, but there is substantial heterogeneity in this trend. We also find that individuals who are more favourable to redistribution contribute more to the public good.

Keywords: Dynamic public good game; Endowment Inequality; Redistribution, Growth.

JEL codes: H41, C72, C92, H29

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[¶]Funding for this project was provided by the National Science Foundation China (NSFC Grant 71903147) and the international incubator project funding Wuhan University. Conflict of Interest Statement: The authors declare that they have no conflicts of interest. All authors contributed equally to this project.

1 Introduction

Creating and maintaining a culture of cooperation and collaboration is crucial for innovation and growth across many organizational and social contexts. These include research and development (Cozzi, 1999; Kamien et al., 1992), joint ventures (Grossman et al., 1986), international collaborations (Ostrom, 1990; Ostrom et al., 1994; Haas, 1990), organizational behavior (Owen, 2004), social challenges (Bauer et al., 2016), and resource optimization (Pesantez et al., 2020). A critical aspect of many of these situations is their *dynamic* and *accumulative* nature: the outcomes at later stages are often contingent upon early-stage performance. For instance, initial investments in R&D can significantly influence the outcomes at subsequent innovation (Lieberman et al., 1988; Markides et al., 2004). Yet, existing studies on cooperation have largely ignored these time dependencies.

In our paper, we contribute to this literature by capturing the dynamic features in collaborative behavior using a dynamic public good game (Gächter et al., 2017). In this game, current endowments are strictly determined by past earnings, creating the dynamic inter-dependencies described above. Within this setting, we examine the influence of *inequality* and *redistribution*. We differentiate two types of inequality: luck-driven exogenous inequality (in initial endowments) and endogenous inequality arising over time in this setting via participants' choices. We explore the effects of these two sources of inequality on long-term growth and cooperation. We also ask how different redistributive policies influence cooperative behavior in this dynamic setting. We derive theoretical benchmarks using a model grounded in standard economic theory (see Gächter et al., 2017) and then conduct a lab experiment.

In our experiment, participants play 15 periods of this dynamic game. We use a 2 × 4 factorial design to investigate the effects of both homogeneous and heterogeneous initial endowments, as well as four different types of redistributive schemes. In the "NoTax" treatments participants simply play the dynamic game introduced by Gächter et al. (2017) either with homogeneous or heterogeneous initial endowments. In treatment "Exo-50", a 50% tax rate is introduced. At the end of each period each participant's overall payoff is taxed and the tax proceed are redistributed equally among all group members. In treatment "Endo", participants can vote every three periods for a new tax rate choosing from 0, 10, 25 or 50% tax. And in treatment "Exo", the tax rate changes exogenously every three periods using a random draw from the distribution obtained in Endo. At the end of every treatment, participants fill in a survey eliciting their attitudes towards redistribution among several other items.

Our results can be summarized as follows. Redistribution curtails inequality. Irrespective of institutional detail, final round inequality is lower in any treatment with redistribution compared to the NoTax treatment. We also find that redistribution is not necessarily harmful to growth. In fact, if initial inequality is high, then a persistent high amount of redistribution (as in Exo-50) can lead to higher final wealth compared to NoTax. Also in the treatments with varying tax rates, contributions are higher for a high tax rate (50%) compared to lower tax rates. Participants understand the benefits of higher tax rate and (in Endo) increasingly vote in favour of higher taxes over time. Interestingly, these results are not in line with theoretical benchmarks where we would either expect no growth (subgame perfect Nash equilibrium) or a detrimental impact of redistribution on growth (sequential equilibrium). Last, we find that participants classified as libertarian based on the post experimental survey lean towards lower tax, whereas individuals with a meritocratic or egalitarian preference prefer higher taxes.

Our work contributes to the extensive literature examining the impact of income inequality on cooperation. In static public good games, there is a longstanding debate regarding the impact of exogenous income inequality. Cherry et al. (2005), Hauser et al. (2019), Heap et al. (2016), Ostrom et al. (1994), and van Dijk et al. (2002), among others, find that income inequality leads to lower contributions, all else equal. Other authors have found no effect (Chan et al., 1996, 1999; Reuben et al., 2013). In addition, Cherry et al. (2005) and Buckley et al. (2006) find that in heterogeneous endowment settings in the static public good game, the rich contribute a lower fraction of their endowment to the public account than the poor. We depart from these static settings to show that in a dynamic framework with wealth accumulation, the impact of inequality is fundamentally shaped by the *tax regime*.

Similar to our study, Uler (2011) also analyzes the impact of ex-ante inequality and (ex-post) redistributive taxation on the provision of public goods in an experiment. She finds that a higher tax rate increases contributions, while equal endowments lead to lower contributions to the public good compared to unequal ones, in line with theoretical predictions in Uler (2009). Our experimental setting differs in at least three aspects from Uler (2011). We consider a dynamic public good game, in which taxes are paid on the total payoffs of the individual, and period payoffs are determined by the standard linear formula. In contrast, Uler (2011) studies a static public good game, where taxes are paid only on the payoffs derived from the private account, and the utility function is quadratic. In that setting, taxation reduces the opportunity cost of contributions, and thus leads to higher public good provision. Studies by Krawczyk (2010) and Sausgruber et al. (2021) also suggest that redistribution mechanisms can enhance cooperative behavior by mitigating inequality and increasing perceived fairness among participants. Our paper contributes to these studies by analyzing redistribution in a dynamic setting with wealth accumulation. Our incorporation of voting for taxation mechanisms enriches the experimental literature on voting in public good games, including in linear public good games where participants vote for cooperation strategies, redistribution and exclusion rules (Kroll et al., 2007; Colasante et al., 2017; Dannenberg et al., 2020) and in threshold public good games where participants vote on the thresholds.

Finally, our study extends the framework of the dynamic public good game introduced by Gächter et al. (2017). We contribute to this literature by introducing institutional variation (redistribution) into a growth framework. This distinguishes our work from the broader literature on dynamic and repeated settings without wealth accumulation. For instance, Fischbacher et al. (2010) focus on conditional cooperation in repeated interactions, while Hauser et al. (2014) and Rand et al. (2014) highlight how the "shadow of the future" fosters cooperative equilibria. While these studies show that the temporal dimension introduces strategic complexities not present in static games, our setting adds the dimension of *path dependence*. In our framework, early decisions determine future feasible sets. We show that in this accumulative context, redistribution is not just a tool for ex-post equity, but a mechanism to alter the trajectory of wealth accumulation by preventing the permanent exclusion of resource-constrained agents.

The paper is organized as follows. In Section 2 we describe the conceptual framework and experimental design. Section 3 contains the main results and Section 4 a discussion and concluding remarks.

2 Conceptual framework and experimental design

This section describes the framework of the dynamic public good game (Section 2.1), the treatments (Section 2.2), and the survey design (Section 2.3).

2.1 Dynamic public good game

In the dynamic public good game n individuals interact in a group. Each individual i is endowed with a budget of w_{i1} in period 1. They can allocate this budget between two accounts: a private account and a group account. The private account has a return of 1. The public account's return is a, and the total amount put in the group account is equally divided among the n group members. To bring out the tension between individual and collective interests, we assume that $a > 1$ and $\frac{a}{n} < 1$. This implies that the individual has no material incentive to put any money in the public account but the total payoff is maximized if all individuals put all their budget in the public account.

Suppose that individual i invests y_{i1} in the public account in period 1. Therefore, the payoff of individual i at the end of period 1 will be: $\pi_{i1} = w_{i1} - y_{i1} + \frac{a}{n}\sum_{k=1}^{n} y_{k1}$. The payoff consists of the returns of the private account $(w_{i1} - y_{i1})$ and the return of the public account which depends on the total contribution to the public account within the group. The key assumption of the dynamic public good game (Gächter et al., 2017) is that the budget at the start of period 2 is equal to the payoffs at the end of period 1: $w_{i2} = \pi_{i1}$.

Given their budget in period 2, individuals make the same allocation decision, as in period 1, between the private and public accounts. This generates their period 2 payoffs and their period 3 budget. The game goes on in the same way for T periods. The general payoff and endowment functions for period $t > 1$ can be written down as:

$$\pi_{it} = w_{it} - y_{it} + \frac{a}{n}\sum_{k=1}^{N} y_{kt}$$

$$w_{i,t+1} = \pi_{it}$$

Using this framework, we study growth as captured by the evolution of wealth levels $w_{i,t}$ and the level of inequality as captured by the Gini coefficient of wealth levels within the group. We introduce treatment variations to analyze the impact of initial inequality and taxation on these outcomes and the trade-offs between growth and inequality.

2.2 Treatments and experimental procedure

The experiment consists of eight treatments varying two dimensions: (i) inequality in the initial endowment (homogeneous vs. heterogeneous) and (ii) the tax system (no tax, endogenous tax, exogenous tax with variable rates, and exogenous tax fixed at 50%). Table 1 summarizes key features of each treatment, which are also described in detail below. Different treatments were run across different sessions. Participants within a session were randomly divided into groups of 4 and stayed in these groups throughout the experiment. For all treatments, parameter a is set to 1.5, leading to the marginal per capita return (MPCR) of the public good to be 1.5/4=0.375.

Table 1: Experimental Design: Key Features of All Treatments

Initial Endowment	**Tax Regime**			
	No Tax	Endogenous Tax (Endog)	Exogenous Tax (Exo)	Exogenous 50% (Exo-50)
Homogeneous (Homo)	$N = 4$; $G = 18$ $w_{i,1} = 30$ $\tau = 0\%$ 15 periods	$N = 4$; $G = 18$ $w_{i,1} = 30$ $\tau \in \{0, 10, 25, 50\}\%$ Vote every 3 periods	$N = 4$; $G = 18$ $w_{i,1} = 30$ $\tau \in \{0, 10, 25, 50\}\%$ Random every 3 periods	$N = 4$; $G = 18$ $w_{i,1} = 30$ $\tau = 50\%$ 15 periods
Heterogeneous (Hetero)	$N = 4$; $G = 24$ $w_{i,1} = 20/40$ $\tau = 0\%$ 15 periods	$N = 4$; $G = 24$ $w_{i,1} = 20/40$ $\tau \in \{0, 10, 25, 50\}\%$ Vote every 3 periods	$N = 4$; $G = 24$ $w_{i,1} = 20/40$ $\tau \in \{0, 10, 25, 50\}\%$ Random every 3 periods	$N = 4$; $G = 18$ $w_{i,1} = 20/40$ $\tau = 50\%$ 15 periods

Notes. This table summarizes the key features of all experimental treatments. N denotes the number of participants per group; G denotes the number of groups per treatment; $w_{i,1}$ indicates initial endowment (equal in Homogeneous treatments; unequal with two values in Heterogeneous treatments); τ refers to the tax rate. In *No Tax* treatments, there is no taxation or redistribution. In *Endogenous Tax* treatments, participants vote on τ every three periods, with one randomly selected voter's preference implemented. In *Exogenous Tax* treatments, τ is randomly determined every three periods using probability distributions from voting patterns in Endogenous treatments. In *Exogenous 50%* treatments, τ is fixed at 50% throughout all 15 periods. Total sample: 648 subjects.

Initial Endowment. In the homogenous treatments, all group members had the same initial endowment ($w_{i,1} = 30$). To examine the effect of initial income inequality on individual contributions and long-run economic growth, in the heterogeneous treatments, half of the group had low endowment ($w_{i,1} = 20$), while half of the group had high endowment ($w_{i,1} = 40$). This implied an initial Gini coefficient of 0.167. We kept the total endowment in the group the same in both treatments to make the two treatments comparable. Initial endowments were allocated and communicated to participants before the start of the first period of the experiment.

Tax System. In the **NoTax** treatments, participants kept all their current income as the initial endowment for the next period (as in Gächter et al. (2017)). In this treatment there is no mention of a tax rate.[1] In the tax treatments a tax rate τ was implemented. Participants' endowment for a given period ($t > 1$) was decomposed into after-tax income $(1 - \tau)\pi_{it}$ and an equal share of the total tax revenue ($\frac{1}{n}\sum_{k=1}^{n} \tau\pi_{kt}$), as shown in equation 1, which describes the evolution of wealth:

[1]This is for two reasons: (i) introducing a tax rate in the experimental instructions and then telling participants "actually the tax rate is 0%" risks confusing them and may create issues of trust; (ii) not mentioning a tax in this treatment is part of the story. This treatment is meant to capture situations without taxation.

$$w_{i,t+1} = (1-\tau)\pi_{it} + \frac{1}{n}\sum_{k=1}^{n}\tau\pi_{kt}. \tag{1}$$

The last term on the right-hand side captures the equal redistribution of tax revenues. The tax serves purely to redistribute payoff within the group.

In the **exogenous 50% tax (Exo-50)** treatments, the tax rate is fixed at 50% throughout all 15 periods. This design allows us to identify the impact of the introduction of a (50%) tax compared to the NoTax treatment.

In the **endogenous tax (Endo)** treatments, participants were given the opportunity to vote for the tax rate at the beginning of the 1st, 4th, 7th, 10th, and 13th periods. Participants voted for the tax rate among four levels 0%, 10%, 25% and 50%. One participant in the group was randomly selected by the computer to be the random dictator, and their voted tax rate was implemented for the following 3 consecutive periods. After the vote, participants are shown the selected tax rate and the number of "votes" each tax rate received. This treatment allows us to understand participants' preferences over redistribution in this context and how they evolve.

In the **exogenous tax (Exo)** treatments the tax rate is randomly determined every three periods using probabilities that match the distribution of tax rates in the endogenous treatments. We ran the endogenous treatments first and then aggregated the votes from all sessions conducted under the endogenous treatment, resulting in a voting distribution for each of the five voting rounds (1st, 4th, 7th, 10th and 13th periods). The probability distribution implied by this distribution was then used to generate tax rates in the exogenous treatments. This procedure ensures that, in expectation, the distribution of tax rates in the exogenous and endogenous treatments are the same.[2] Comparing this treatment with the endogenous treatment allows us to understand the impact of "democratic legitimacy" on how people respond to a tax. Table 1 summarizes our treatment structure.

Procedures Participants were not allowed to communicate during the experiment. At the end of each period they received feedback on all group members: (i) initial endowment; (ii) contribution to the group project; (iii) return from the group project; (iv) (after-tax) payoff. Participants were paid based on the (after-tax) payoff at the end of the 15th period. The experiments were conducted in the laboratory of the Center for Behavior and Economic Research (CBER) at the Wuhan University between March 2023 and November 2025. We had in total 648 participants in

[2]While in expectation, the two treatments will feature the same distribution of tax rates, they will not necessarily feature the same *sequences of tax rates*. To account for this some of our results comparing these treatments will focus on the first three periods of each treatment, where there is no history of prior taxation and where, conditional on the current tax rate, the only difference between the treatments is whether the tax was imposed endogenously or exogenously.

this study. Participants were recruited from the lab's standing pool of participants, managed using the WeChat-based Weikeyan system. Upon arrival at the laboratory, participants randomly selected an ID number to determine their computer terminals to ensure randomization across cohorts. The experiment was computerized using zTree (Fischbacher, 2007). Sessions lasted between 50 to 60 minutes, and the average earnings per participant were 86.5 yuan (approximately 12 US dollars), including a participation fee of 15 yuan.

2.3 Post-experiment questionnaire

To understand heterogeneity in the treatment effects, we conducted an array of surveys at the end of the experiment. This part is common to all treatments. We describe the survey items here briefly and more details on the post-experimental surveys can be seen in Appendix E.

Belief in Just Word. We include five questions from the World Value survey to elicit participants' preference for redistribution (Haerpfer et al., 2022). Participants choose on a scale of 10 to which extent they agree with different statements. A typical question in this module is for example "Q5. Hard work doesn't generally bring success - it's more a matter of luck and connections. versus. In the long run, hard work usually brings a better life."

Fairness Belief. We adopted a survey vignette approach inspired by Almås et al. (2020). Participants were instructed to make redistribution decisions in a scenario in which two interns received different levels of pay. The vignette varied the underlying cause of this initial inequality, attributing it either to differences in effort or to luck. Furthermore, in scenarios where luck was the source of inequality, we introduced a variation on whether redistributing the pay was associated with a cost. In each scenario, participants assumed the role of an arbitrator, making redistribution decisions without any impact on their own financial compensation.

Risk- and Social-preferences. Finally, we included eight qualitative questions adapted from the Domain Specific Risk Taking Task (DomSRT) and prosociality questionnaire to elicit participants' risk- and social-preferences (Blais et al., 2006). For example, for risk preference, participants were asked to rate from "extremely unlikely" to "extremely likely" at a 7-Likert Scale on questions like "Disagree with an authority figure on a major issue.". For social preferences a typical statement is "Participate in volunteer activities for a long time".

We also include a general survey of questions related to the specific experiment, like for example: "In this experiment, it is fair to tax people with high income" (agreement on a scale of 1-10); as well as a standard inventory of demographic questions, including gender and laboratory experience.

2.4 Theoretical Framework and Predictions

In this section, we introduce a few theoretical considerations that serve as a benchmark to evaluate the experimental findings. To derive these, we follow the modeling approach from Gächter et al. (2017). All proofs and notation details are relegated to Appendix A.

It is a well-known result that the subgame-perfect equilibrium in the finitely repeated public goods game is to contribute zero to the public good in all periods. We can easily extend this result to the dynamic public good game with growth.

Proposition 1. *Consider all treatments of the dynamic public good game as defined above. The unique subgame-perfect Nash equilibrium (SPNE) is such that every player contributes 0 at every history.*

Zero contributions imply that there is no wealth accumulation over time and hence, initial endowment disparities have a long-term effect. This means that inequality in payoffs is higher in the Hetero than in the Homo treatment. Redistributive taxation will reduce inequality in the Hetero treatment since it distributes resources from those with high to those with low initial endowment. When it comes to voting on the tax rate, individuals vote for the tax rate that is best for their own payoffs. Those with low initial endowment benefit from income redistribution and thus vote for a 50% tax rate, while those with high initial endowment are hurt by redistribution and thus vote for a 0% tax rate. We summarize the implications of this result for other outcomes of interest in the following corollary.

Corollary 1. *Proposition 1 implies that if play is consistent with subgame perfect Nash equilibrium (SPNE) then*

a. There is no growth in any treatment (irrespective of the level of taxes);

b. Inequality is higher in the treatments with heterogeneous initial endowments compared to those with homogeneous initial endowments;

c. Taxes will reduce inequality in treatments with heterogeneous initial endowments and have no effect in treatments with homogeneous initial endowments;

d. When initial endowments are heterogeneous, the rich (those with initial endowment 40) will vote for zero tax rate, while the poor (those with initial endowment 20) will vote for 50% tax rate.

While the subgame-perfect Nash equilibrium gives a sharp prediction, it cannot explain positive contributions in a public good game. Following Gächter et al. (2017) and Kreps et al. (1982), we consider a setting of incomplete information with types whereby individuals believe that with some small probability δ others in the group play a tit-for-tat (TFT) strategy and with the remaining probability, $1 - \delta$, they follow the 'rational strategy' of zero contributions. Tit-for-tat players contribute their full endowment in period 1 and then in periods $t \geq 2$ match the minimum proportional contribution they observed in the group in period $t - 1$. Individuals rationally update beliefs upon seeing others' contributions. Kreps et al. (1982) show that a small chance of facing TFT players can generate full cooperation for a certain number of periods in the finitely repeated prisoner's dilemma, before the breakdown of cooperation. Gächter et al. (2017) show that a similar result holds in a dynamic public good game with growth. In particular, they show that a small chance of facing TFT group members can generate initial positive contributions on the equilibrium path. In Appendix A, we extend their results to the case of redistributive taxation.

Proposition 2. *Consider all treatments of the dynamic public good game as defined above. There exist beliefs on δ such that for any arbitrary symmetric sequential equilibrium, there is some period $t \geq 1$, such that every player contributes their full endowment up until period t, and contributes 0 in the remaining periods.*

We highlight that if all members of the group contribute their full endowment in period 1 then they will all have the same payoff at the end of period 1, irrespective of the level of initial endowment. Initial endowment inequality will be washed out and have no impact in the long run. This also implies that the tax rate has no impact on the level of inequality. We prove the following result in Appendix A.

Corollary 2. *Proposition 2 implies that for symmetric sequential equilibria with positive contributions:*

a. Initial endowment inequality has no impact on long-run wealth and inequality.

b. A higher tax rate leads to a shorter spell of cooperation and lower final wealth, while it has no impact on the level of inequality.

c. Individuals have incentives to vote for the lowest tax rate of 0%.

We can explain the intuition behind the comparative statics result with respect to the tax rate as follows. The length of the cooperation spell is determined by the indifference point between continuing to contribute the full endowment and deviating to zero contributions. We show in Appendix A that a higher tax rate reduces the payoffs from deviating to zero contributions as the tax will take away some of the benefits of deviation. On the other hand, a higher tax rate increases the payoffs from continuing to contribute the full endowment. This increase and the reduction in the deviation payoffs need to be offset by a shorter expected cooperation, in order to establish indifference between the two. Since cooperation in the form of full contribution to the public good leads to the accumulation of wealth and a higher payoff at the end of the last period, rational players will prefer a zero tax rate as it ensures the longest cooperation spell among the different tax rates available.

The extremes of everyone contributing zero or everyone contributing their full endowment are rarely observed in the lab Gächter et al. (2017). Propositions 1 and 2 should not, therefore, be seen as providing specific predictions for our experiments. Instead, they provide contrasting theoretical benchmarks with which to motivate and evaluate our experimental results. To demonstrate we summarize the theoretical benchmarks for three key issues of interest: (a) Inequality: With SPNE (Proposition 1) initial endowment inequality persists and is reduced with taxation. With a sequential equilibrium (Proposition 2) initial endowment inequality is immediately washed out by contributions to the public good (and taxation makes no difference). It is, thus, of interest to see whether initial endowment inequality persists and whether taxation reduces inequality. (b) Growth: With SPNE there is no growth, with or without taxation. With a sequential equilibrium there is growth and the level of growth is higher the lower the tax rate. It is, thus, of interest to see whether we do observe growth and how the rate of growth is impacted by taxation. (c) Voting: With SPNE, given that inequality persists, individuals vote for the 0% or 50% tax depending on whether they have a high or low initial endowment. With a sequential equilibrium, given that inequality is washed out, individuals vote for the 0% tax to boost growth. It is, thus, of interest to see whether participants vote for high or low taxes.

3 Results

In this section we present our main experimental results focused on the following research questions. First, how do *contributions* to the public good evolve in a dynamic setting under different tax regimes (Section 3.1)? Second, how do these contribution patterns translate into *wealth* accumulation over time (Section 3.2)? Third, how does redistribution through taxation affect *inequality* dynamics within groups (Section 3.3)? Finally we ask which *behavioral mechanisms* underlie these patterns—specifically, how do voting behavior, individual redistribution preferences, and initial endowment heterogeneity shape outcomes (Section 3.4).

3.1 Contributions

We first establish results regarding contributions. Contributions to the public good represent the fundamental cooperative decision in our experiment, and understanding contribution patterns is essential for interpreting subsequent results.

3.1.1 Treatment Differences in Contributions

For the analysis of treatment differences in contributions we pool data from the Homo and Hetero conditions as they do not show significant differences in mean contributions irrespective of the tax condition (see Appendix Table A1 for the corresponding statistical tests).

Result 1 (Treatment Differences in Contributions)**.** *Contributions are highest under a constant 50% tax rate (Exo-50 treatment) and in the absence of taxation (NoTax treatment), and significantly lower under the variable tax regimes (Endo and Exo).*

Table 2: Contributions, Wealth, and Inequality across Tax Regimes

	NoTax	Endo	Exo	Exo-50
Contributions (Proportion)				
Mean (Median)	0.42 (0.41)	0.33 (0.31)	0.35 (0.33)	0.44 (0.43)
Wealth				
Mean (Median)	468.7 (148.1)	247.4 (90.0)	301.4 (104.8)	534.2 (158.9)
Gini Coefficient				
Mean (Median)	0.13 (0.12)	0.08 (0.07)	0.08 (0.07)	0.04 (0.04)
Permutation tests (p-values)				
Contribution	NoTax vs. Var-Tax: $p = 0.020$;		NoTax vs. Exo-50: $p = 0.854$	
Wealth	NoTax vs. Var-Tax: $p = 0.013$;		NoTax vs. Exo-50: $p = 0.680$	
Gini	NoTax vs. Var-Tax: $p < 0.01$;		NoTax vs. Exo-50: $p < 0.01$	

Notes. Average contributions, wealth and Gini coefficient across 15 periods by treatment. Contributions are measured by the proportion of endowment contributed to the group account. Wealth is measured as average payoff per period. The Gini coefficient measures within-group inequality. Unit of observation: group level; 162 groups of four participants. Numbers in parentheses report median values. Data pooled across Homo and Hetero initial endowment conditions. "Var-Tax" refers to pooled Endo and Exo treatments with variable tax rates; Exo-50 tested separately as it has a constant 50% tax rate. Permutation tests use group-level averages. See Appendix Table A1 for results separated by initial endowment condition.

Support for this result comes from Table 2 and Figure 1. Table 2 presents summary statistics for our three main outcome variables - contributions, wealth, and inequality -averaged across all 15 periods for each of the four tax treatments. Contributions are measured by the proportion of their endowment participants allocate to the group account; wealth is measured as average payoff across all periods and individuals; and inequality is measured using the average Gini coefficient within groups (across all periods and groups). The table reports both mean and median (in parentheses) values, with statistical tests comparing treatments shown at the bottom.

Table 2 shows that participants contributed an average of 42% of their endowment in NoTax treatments and 44% in Exo-50 treatments, with no significant difference between these two conditions ($p = 0.854$). By contrast, contributions were significantly lower in both Endo treatments

(33%) and Exo treatments with variable tax rates (35%) compared to the NoTax treatment (permutation test pooled variable tax vs NoTax, $p = 0.020$). Lower contributions in variable tax regimes can be due to differing tax rates, history dependence, or to dynamic effects hidden by the aggregation of all 15 periods in Table 2. To study the impact of tax rates and eliminate the effect of history dependence and aggregation across all 15 periods, we show results in Table A2 in the Appendix for the first three periods of the game only. We obtain the same results as for the sample of all 15 periods. Across the first three periods, Exo-50 sustains the highest contributions (61%), NoTax achieves the second highest (56%), while variable tax regimes remain significantly lower (Endo: 45%, Exo: 48%).

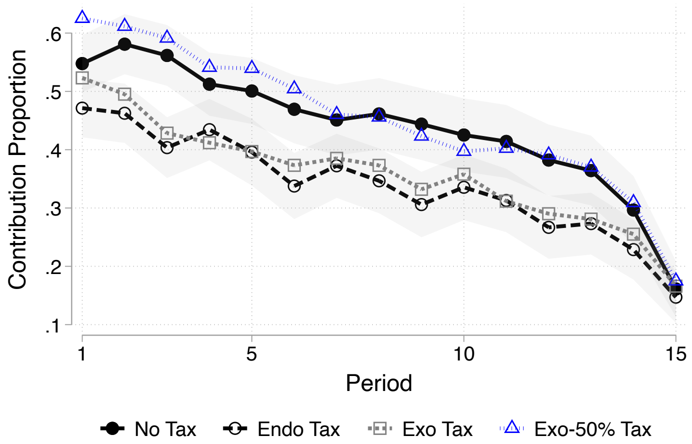


Figure 1: Proportion of Endowment Contributed across Treatments

Notes. Average contribution proportion (share of endowment allocated to the group account) across treatments over 15 periods. Lines represent mean contribution proportions; Data pooled across Homo and Hetero initial endowment conditions.

Figure 1 illustrates the dynamics of these contribution patterns over all 15 periods. In line with standard findings in repeated public good games, contributions exhibit a general downward trend across all treatments. Treatment differences emerge within the first three periods and remain stable until the last few periods of the experiment. Analysis presented in Appendix Table A3 shows that these differences do not disappear with learning. In the first half of the experiment (Periods 1-7) NoTax (52%) and Exo-50 (55%) significantly outperform Endo (41%) as endogenous groups experience different tax rates. In the second half (Periods 8-15), contributions decline across all treatments and at a very similar rate, though somewhat slower in NoTax (28.8%) compared to Endo or Exo-50 (33-34%). In addition, Appendix Table A4 shows regression results controlling for individual characteristics and temporal trends, confirming the treatment differences at the individual level.

It may seem puzzling at first that the Exo-50 and NoTax treatments both induce higher contribution proportions compared to the two treatments with variable tax rates which always feature tax rates in between 0% (as in NoTax) and 50% (as in Exo-50). To understand where these differences come from, we first study contributions by tax rate and then move on to wealth and inequality.

3.1.2 Contributions by realized tax rate

We now compare contributions across *realized* tax rates in different treatments.

Result 2 (Contributions by tax rate)**.** *Contributions are highest when groups implement or experience a 50% tax rate, whether through endogenous voting (Endo) or exogenous imposition (Exo-50, Exo), or in the NoTax treatment.*

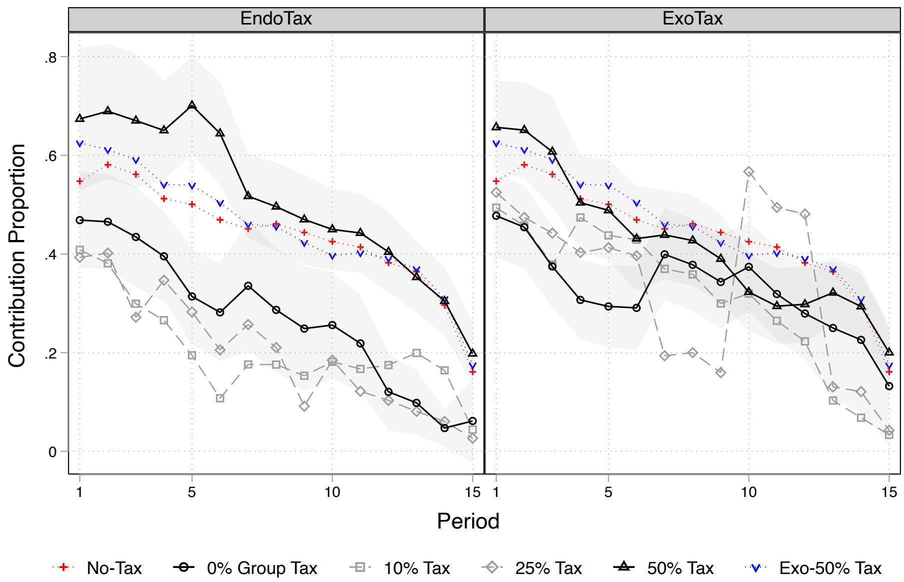


Figure 2: Proportion of Endowment Contributed by *Realized* Tax Rate across Treatments

Notes. Contribution proportions over 15 periods, grouped by realized tax rate within each treatment. Left panel: Endo treatments where tax rates were voted on every three periods. Right panel: Exo treatments where tax rates were randomly determined every three periods. Both panels show NoTax (red crosses) and Exo-50 (blue inverted triangles) as constant-tax baselines. Shaded areas represent 95% confidence intervals for NoTax and 50% tax groups. Data pooled across Homo and Hetero conditions.

Support comes from Figure 2, which shows contribution patterns grouped by realized tax rate within each treatment. The left panel (Endo treatment) shows that contributions are highest when the group implements a 50% tax rate (black triangles, 46% on average) and much lower with the smaller tax rates. The right panel (Exo treatments with variable rates) shows similar patterns but with smaller differences between tax rates. Again, the 50% tax yields the highest contributions (38% on average) but the other tax rates also induce contributions above 30% on average. Both panels also display Exo-50 (blue inverted triangles), where a 50% tax is implemented consistently throughout all 15 periods. This treatment sustains contributions at an average rate of 44%, nearly as high as NoTax (42%, red crosses) and around the contribution rate observed for a 50% tax in Exo and Endo. We also consider the first three periods of each game, as it is possible that in later rounds comparisons are affected by differing histories.[3] When we do this we see that conditional on a high tax rate (50%) contributions are higher in Endo compared to Exo, and conditional on a low tax rate (10 or 25%) contributions are lower in Endo compared to Exo (see Table A8).

The differential effects of the tax rate under Endo and Exo, as well as, the difference in contributions between the two conditions for the same experienced tax rate, are likely to be due to self-selection. More cooperatively inclined groups both vote for higher taxes and contribute more. However, it is not only self-selection that impacts behaviour in Endo. We have also seen that on average contributions in the endogenous tax treatment are significantly lower compared to NoTax (33% vs 42%). We conjecture that conditionally cooperative participants who end up in a group that votes for low (or no) taxes contribute less than they would if the same tax rate was exogenously assigned, as the vote signals low cooperative intention by the group members. This interpretation is supported by the evidence presented in Section 3.4, where we show that votes are indeed informative about cooperative intentions.

In sum, we have seen that contributions are highest either when groups experience a high tax rate (50%) or in the NoTax treatment. Self-selection of cooperative individuals can explain why contributions are highest if the 50% tax rate is voted on endogenously and lowest when low tax rates are voted on endogenously. In addition, votes are informative about cooperative inclinations, which can explain an additional detrimental effect of low taxes in the endogenous treatment.[4] Because wealth accumulates dynamically in our experiment—with each period's payoff becoming the next period's endowment—these contribution differences compound over time, generating substantial differences in wealth accumulation that we examine next.

[3]While in expectation, the two treatments will feature the same distribution of tax rates, they will not necessarily feature the same *sequences of tax rates*.

[4]Even in the exogenous treatment low taxes generate lower contributions than the 50% tax rate. The differences here are smaller, though, decreasing further in the second half of the experiment.

3.2 Wealth

Given that wealth accumulates dynamically in our experiment—with each period's payoff becoming the next period's endowment—the contribution differences documented above compound over time. While we didn't see any substantial differences in contributions in the Homo and Hetero conditions, these can become relevant for wealth accumulation, which is the focus of this section.

Result 3 (Wealth)**.** *Taxation does not necessarily lower wealth. In fact, with heterogeneous initial endowments, Exo-50 generates higher wealth on average than the NoTax treatment.*

Support for this result comes from Figure 3, Table 3, and Appendix Table A1. Figure 3 illustrates wealth dynamics over time, with separate panels for Homogeneous (left) and Heterogeneous (right) conditions. In the left panel (Homo), final wealth in the NoTax treatment reaches an average of 1,750 tokens by period 15. In the right panel final wealth in NoTax is somewhat lower. The impact of the tax on wealth depends on the initial condition. With homogeneous endowments, all tax treatments lead to lower final wealth relative to no taxation. In the right panel of Figure 3 (Hetero), by contrast groups in Exo-50 reach an average wealth of 2,962 in round 15 compared to 1,544 in NoTax, a substantial difference.

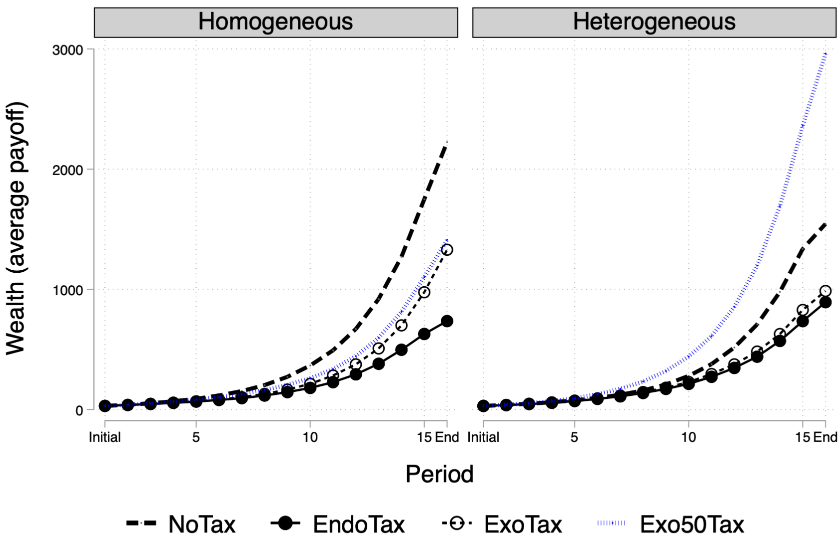


Figure 3: Wealth Over Time by Treatment and Initial Endowment Condition

Notes. Average wealth (payoff) over 15 periods. Left panel: Homogeneous treatments. Right panel: Heterogeneous treatments.

Table 3 digs deeper into these results. In the Homo treatments, NoTax generates average wealth across all periods of 545.0 compared to 364.7 in Exo-50—a 33% reduction, which is however not statistically significant (see Wald-test in Table 3) . By contrast, in the Hetero treatments, Exo-50 generates average wealth of 703.8 compared to 411.5 in NoTax—a 71% increase (Wald-test $p < 0.001$). The coefficient on Homo-Exo50Tax is -0.121 (negative but not significant, $p = 0.418$), while Hete-Exo50Tax is +0.284 (positive and marginally significant, $p < 0.1$). Wald tests comparing each treatment to its respective NoTax baseline confirm that Exo-50 significantly increases wealth in Hetero ($p < 0.001$) but not in Homo ($p = 0.418$). The Hetero-Exo50Tax × Period coefficient (+0.0440, $p < 0.10$) indicates that the wealth advantage in Hetero grows over time in line with exponential growth characteristic of this setting.

Table 3: Wealth and Inequality across Treatments: Random Effect Models

	Log Wealth			Gini		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Dummies						
Homo-Endo	-0.450***	-0.407***	-0.036	-0.044***	-0.044***	0.004
	(0.148)	(0.148)	(0.067)	(0.011)	(0.011)	(0.010)
Homo-Exo	-0.361**	-0.316**	-0.067	-0.042***	-0.041***	0.025**
	(0.154)	(0.155)	(0.070)	(0.012)	(0.012)	(0.012)
Homo-Exo-50	-0.121	-0.128	0.040	-0.083***	-0.081***	-0.0480***
	(0.150)	(0.148)	(0.062)	(0.010)	(0.010)	(0.009)
Hetero-NoTax	-0.271*	-0.231	-0.034	0.023*	0.022	0.027***
	(0.162)	(0.162)	(0.067)	(0.014)	(0.014)	(0.010)
Hetero-Endo	-0.315**	-0.291**	-0.098	-0.029***	-0.030***	0.037***
	(0.147)	(0.147)	(0.066)	(0.011)	(0.011)	(0.010)
Hetero-Exo	-0.240*	-0.205	-0.009	-0.045***	-0.043***	-0.006
	(0.144)	(0.146)	(0.065)	(0.011)	(0.011)	(0.009)
Hetero-Exo-50	0.284*	0.283*	-0.068	-0.072***	-0.070***	-0.032***
	(0.163)	(0.162)	(0.066)	(0.010)	(0.011)	(0.009)
Period	0.161***	0.161***	0.178***	-0.001***	-0.001***	0.002***
	(0.004)	(0.004)	(0.017)	(0.000)	(0.000)	(0.000)
Treatment × Period interactions						
Homo-Endo × Period			-0.046**			-0.006***
			(0.020)			(0.000)
Homo-Exo × Period			-0.031			-0.008***
			(0.021)			(0.000)
Homo-Exo-50 × Period			-0.021			-0.004***
			(0.020)			(0.000)
Hetero-NoTax × Period			-0.024			-0.000
			(0.022)			(0.001)
Hetero-Endo × Period			-0.024			-0.008***
			(0.020)			(0.001)
Hetero-Exo × Period			-0.024			-0.004***
			(0.019)			(0.001)
Hetero-Exo-50 × Period			0.044*			-0.004***
			(0.022)			(0.000)
Constant	3.791***	4.523***	4.388***	0.134***	0.043	0.006
	(0.117)	(0.495)	(0.484)	(0.009)	(0.037)	(0.037)
Individual characteristics	No	Yes	Yes	No	Yes	Yes
Observations	9720	9720	9720	9720	9720	9720
Wald tests of linear combinations (p-values)						
Var-Tax vs. NoTax (pooled)	$p = 0.004$			$p < 0.001$		
Homo: Exo50 vs. NoTax	$p = 0.418$			$p < 0.001$		
Hetero: Exo50 vs. NoTax	$p < 0.001$			$p < 0.001$		
Interaction: (Hetero-Exo-50 - Hetero-NoTax) vs. (Homo-Exo-50 - Homo-NoTax)						
	$p = 0.001$					

Notes. Random effects panel regressions. Dependent variable: log(wealth) in columns 1-3; Gini coefficient in columns 4-6. Unit of observation: individual-period (periods 1-15). Baseline: Homo-NoTax. Robust standard errors clustered at subject level. Individual characteristics: age, gender, risk preferences, lab experience, major, education, siblings. Treatment × Period interactions capture treatment-specific time trends. Observations: 9,720 (648 subjects × 15 periods). Interaction test compares Exo50 effect in Hetero vs. Homo. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In sum, variable tax rates reduce wealth in the long run due to the lower contributions to the public good relative to the no tax condition. The impact of stable high tax rates on wealth reveal a critical interaction between taxation and initial inequality. In homogeneous groups, Exo-50 moderately reduces wealth relative to NoTax while in initially heterogeneous groups, it improves wealth creation. Next, we examine how different tax regimes affect distributional outcomes.

3.3 Inequality

We now examine how redistributive taxation affects inequality in the dynamic public goods game.

Result 4 (Inequality)**.** *All tax regimes reduce inequality relative to no taxation, with the 50% tax rate achieving the lowest inequality levels.*

Support for this result comes from Appendix Table A1, Table 3, and Figure 4. Appendix Table A1 shows the Gini coefficient for the different treatments. In the Homo treatments, the Gini coefficient averages 0.11 for NoTax, 0.07 for both Endo and Exo variable tax regimes, and 0.03 for Exo-50—representing a 73% reduction in the latter compared to NoTax. In the Hetero treatments, Gini coefficients are 0.14 for NoTax, 0.09 for Endo, 0.08 for Exo, and 0.05 for Exo-50—a 64% reduction in the latter compared to NoTax. All tax treatments differ significantly from NoTax (permutation tests, $p < 0.01$ for all comparisons).

Figure 4 illustrates the temporal evolution of inequality across treatments, with results presented separately for the homogeneous (left panel) and heterogeneous (right panel) initial conditions. Initially inequality increases in the Homo treatments from a starting point of zero. NoTax (dashed line) then exhibits steadily rising inequality throughout the experiment, reaching Gini coefficients around 0.20 by period 15. All tax treatments, by contrast, show declining inequality over time (after the initial increase in the homogeneous conditions).

Regression analysis in Table 3 (columns 4-6) confirms these patterns. All tax treatment coefficients are negative and highly significant, indicating substantial inequality reduction relative to the NoTax baseline. The coefficients on Homo-Exo50Tax and Hete-Exo50Tax (-0.0815 and -0.0703 in column 5) have the highest magnitude, confirming that Exo-50 achieves the greatest inequality reduction. Wald tests confirm that Exo-50 differs significantly from NoTax in inequality ($p < 0.001$) in both Homo and Hetero conditions.

Combining the wealth results from Section 3.2 with these inequality findings reveals an important asymmetry across initial endowment conditions. With homogeneous initial endowments NoTax achieves higher wealth (545.0) than Exo-50 (364.7) but also higher inequality (Gini = 0.11 vs. 0.03). There is a trade-off between wealth and equality. By contrast, in the heterogeneous condition Exo-50 achieves both higher wealth (703.8 vs. 411.5) and lower inequality (Gini = 0.05 vs. 0.14) than NoTax. With heterogeneous initial endowments it seems a sort of "best of both worlds" outcome is possible achieving high wealth while simultaneously maintaining very low inequality.

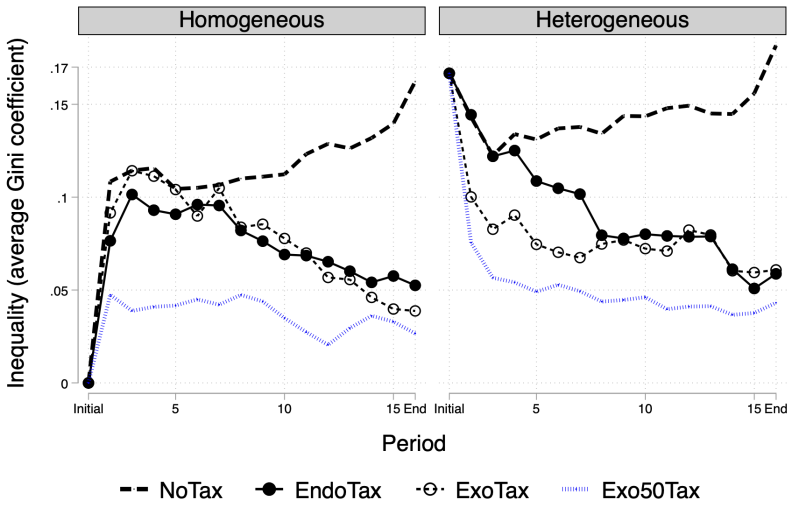


Figure 4: Within-group Inequality Over Time by Treatment and Initial Endowment Inequality

Notes. Within-group inequality (measured by the within-group Gini coefficient) over 15 periods. Left panel: Homogeneous treatments. Right panel: Heterogeneous treatments. In both panels, NoTax (dashed line) exhibits rising inequality over time, while all tax treatments show declining inequality. Exo-50 (dotted line) achieves the lowest terminal inequality in both conditions. Variable tax regimes (solid and hollow circles) achieve intermediate inequality levels.

3.3.1 The Wealth-Inequality Distribution

Average effects may mask heterogeneity across groups. We now examine the joint distribution of wealth and inequality outcomes at the group level rather than merely focusing on average effects. We categorize each group at the end of period 15 into one of four types based on whether they exceed the overall (all treatment) median in wealth and inequality: (1) high-wealth-high-inequality, (2) high-wealth-low-inequality (the most desirable outcome), (3) low-wealth-high-inequality (the least desirable outcome), and (4) low-wealth-low-inequality.

Result 5 (The Wealth-Inequality Distribution)**.** *(a) Exo-50 completely eliminates the worst outcome (low-wealth-high-inequality), which affects 40% of NoTax groups. (b) NoTax produces the highest proportion of groups with high-wealth-high-inequality. (c) Compared to NoTax the treatments with varying tax rates shift outcomes toward low-wealth-low-inequality, trading off prosperity for equality.*

Support comes from Figure 5 and Table 4. Figure 5 shows the joint distribution of wealth and inequality in round 15. The No-Tax panel (leftmost) shows wide dispersion with substantial

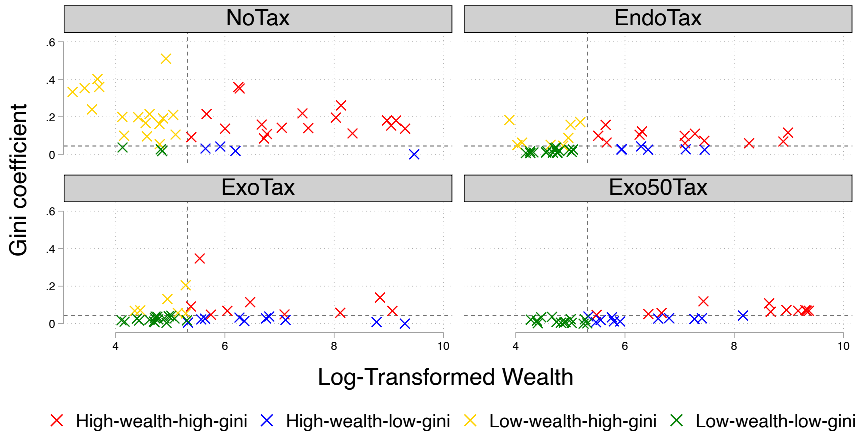


Figure 5: Final Wealth and Inequality Distribution by Treatment

Notes. Distribution of 162 groups (NoTax/Endo/Exo: 42 each; Exo-50: 36) in wealth-inequality space at the end of period 15. Each marker represents one group of four participants. X-axis: log(wealth); Y-axis: Gini coefficient. Dotted lines represent the overall median splits. Colors indicate outcomes: red = high-wealth-high-inequality, blue = high-wealth-low-inequality (most desirable), yellow = low-wealth-high-inequality (least desirable), green = low-wealth-low-inequality.

clustering of red markers (high-wealth-high-inequality) in the upper-right quadrant and yellow markers (low-wealth-high-inequality, the worst outcome) in the upper-left. Only a few blue markers (high-wealth-low-inequality, the best outcome) appear. The two variable tax treatment panels (Endo and Exo, center panels) show similar patterns: groups shift leftward (lower wealth) and downward (lower inequality), with many green markers (low-wealth-low-inequality) clustered in the lower-left quadrant. Some blue markers appear, indicating these regimes successfully reduce inequality but often at the cost of reduced wealth. The Exo-50 panel (right panel) reveals two distinct patterns. First, and most strikingly, there are no yellow markers—not a single group experiences the worst outcome of low-wealth-high-inequality. Second, groups cluster around lower Gini values (closer to the horizontal axis) while maintaining substantial wealth dispersion, with balanced representation across high-wealth-high-inequality (red), high-wealth-low-inequality (blue), and low-wealth-low-inequality (green) categories.

Table 4: Distribution of Groups by Wealth-Inequality Category

	High-Wealth		Low-Wealth	
	High-Gini (1)	Low-Gini (2)	High-Gini (3)	Low-Gini (4)
NoTax	18 (43%)	4 (10%)	17 (40%)	3 (7%)
Endo	12 (29%)	6 (14%)	8 (19%)	16 (38%)
Exo	9 (21%)	10 (24%)	6 (14%)	17 (40%)
Exo-50	11 (31%)	11 (31%)	0 (0%)	14 (39%)
Chi-square tests comparing distributions (p-values):				
NoTax vs. Endo :			$\chi^2(3) = 13.73$,	$p = 0.003$
NoTax vs. Exo :			$\chi^2(3) = 20.63$,	$p < 0.001$
NoTax vs. Exo-50:			$\chi^2(3) = 28.78$,	$p < 0.001$
Endo vs. Exo :			$\chi^2(3) = 1.74$,	$p = 0.627$

Notes. Number (and percentage) of groups in each category at the end of period 15. NoTax, Endo, and Exo each have N=42 groups (18 Homo + 24 Hetero); Exo-50 has N=36 groups (18 Homo + 18 Hetero). Total: 162 groups. Categories defined by overall median splits: high-wealth = above median log(wealth); low-Gini = below median Gini coefficient. Chi-square tests assess whether the distribution of groups across the four categories differs significantly between treatments.

Table 4 quantifies these patterns. NoTax produces the most polarized outcomes: 18 groups (43%) achieve high-wealth-high-inequality, while only 4 (10%) achieve the desirable high-wealth-low-inequality combination. 17 groups (40%) end up in the worst outcome of low-wealth-high-inequality. Variable tax regimes (Endo and Exo) show similar distributions to each other (χ^2 test $p = 0.627$). They substantially reduce the proportion of groups in the worst category (column 3: 19% for Endo, 14% for Exo vs. 40% for NoTax) and increase those achieving low-wealth-low-inequality (column 4: 38-40% vs. 7% for NoTax). However, this comes at the cost of fewer high-wealth outcomes: only 43% of Endo groups and 45% of Exo groups achieve high wealth, compared to 52% for NoTax. Exo-50 shows zero groups (0%) fall into the worst category. All 36 groups distribute across the remaining three categories: 11 (31%) high-wealth-high-inequality, 11 (31%) high-wealth-low-inequality, and 14 (39%) low-wealth-low-inequality.

3.4 Behavioral mechanisms and individual heterogeneity

The previous sections established that different tax regimes produce distinct patterns of contributions, wealth, and inequality. We now examine the behavioral mechanisms underlying these patterns, focusing on two sources of heterogeneity: (1) individual preferences regarding redistribution, which influence both voting and contribution decisions, and (2) differences based on initial endowments (rich vs. poor), which affect behavior in heterogeneous treatments.

3.4.1 Voting Dynamics

We begin by analyzing how participants vote on tax rates in the Endo treatments and how these voting patterns evolve over time.

Result 6 (Voting)**.** *Participants increasingly vote for higher taxes over time, with support for the 50% tax rate rising from 17% in period 1 to 55% in period 13.*

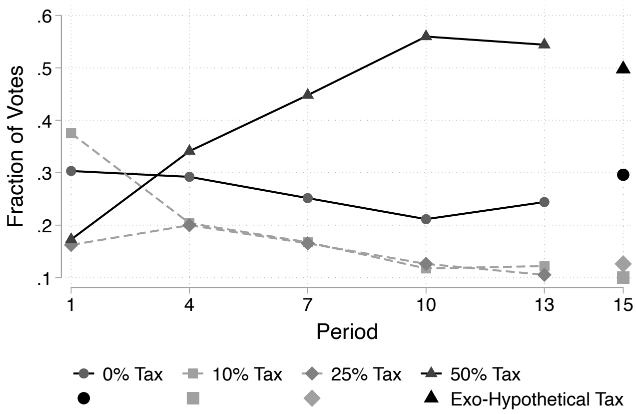


Figure 6: Voting Distribution across Time in Endogenous Tax treatments

Notes. Proportion of participants voting for each tax rate across periods 1, 4, 7, 10, and 13 in Endo treatments. Data points at period 15 represent participants' post-experimental hypothetical votes in Exo treatments. Data pooled across Homo and Hetero conditions.

Support comes from Figure 6, which plots the fraction of participants who voted for each tax rate (0%, 10%, 25%, and 50%) over time in the Endo treatments (periods 1, 4, 7, 10, and 13). We also display the hypothetically preferred tax rate stated by participants in Exo treatments at the end of period 15. Two patterns emerge from Figure 6. First, there is polarization toward extreme tax rates, particularly in later periods. The most popular initial tax rate (period 1) is 10%, chosen by 38% of participants. By period 13, however, voting concentrates at the extremes: 23% vote for 0% tax and 55% vote for 50% tax, with intermediate rates (10% and 25%) garnering only 22% combined. Second, there is a clear trend toward higher taxes over time. Support for the 50% tax rate increases from 17% in period 1 to 55% in period 13. This shift is not unique to the Endo treatments: when Exo participants state their hypothetical preferred tax rate at the end of the experiment (after experiencing exogenously imposed tax rates), 49% choose 50%.

The increasing support for high taxes, combined with our earlier finding that high taxes sustain contributions (Section 3.1), suggests potential self-reinforcing dynamics: groups that implement high taxes may experience benefits that strengthen support for continued high taxation.

3.4.2 Sorting, signaling and fairness

In this section, we further investigate the behavioral patterns that relate tax preferences to contributions briefly examined in section 2. Firstly, we study how sorting by redistribution preferences determines both voting and contributions in the Endo treatments using the redistribution preferences elicited in our post-experimental survey.

Following Almås et al. (2020), we classify participants into three types based on their redistribution decisions across scenarios varying the source of inequality (effort vs. luck) and the cost of redistribution:

- **Libertarian**: No redistribution regardless of inequality source.
- **Meritocratic**: Redistribute when inequality stems from luck but not from effort.
- **Egalitarian**: Redistribute regardless of inequality source.

Figure 7 shows the distribution of these preference types among our 648 participants.

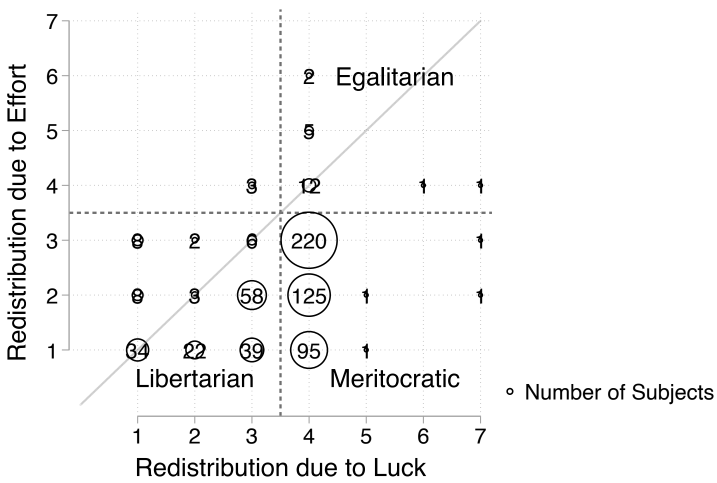


Figure 7: Distribution of *Redistribution Preferences*

Notes. Classification of 648 participants based on redistribution decisions across three vignette scenarios. X-axis: redistribution in effort-based inequality scenario. Y-axis: redistribution in luck-based inequality scenario. Each point represents one participant. Colors indicate preference type: libertarian (no redistribution), meritocratic (redistribute luck-based inequality only), egalitarian (redistribute all inequality). Three participants (0.5%) exhibit inconsistent patterns and are excluded from regression analyses.

Almost all participants (645 out of 648) fall cleanly into one of the three categories. The dominant type is meritocratic (444 participants, 69%), followed by libertarian (180 participants, 28%), with egalitarian preferences being rare (21 participants, 3%). This distribution differs markedly from Western samples studied by Almås et al. (2020), where libertarian preferences are more prevalent, possibly reflecting cultural differences in redistribution norms.

Result 7 (Redistribution preferences, Voting and Contributions)**.** *(a) Participants with meritocratic preferences vote for significantly higher taxes than those with libertarian preferences. (b) Participants with meritocratic preferences contribute significantly more to the public good than those with libertarian preferences. (c) The relationship between voted tax rate and contributions exhibits a J-shaped pattern.*

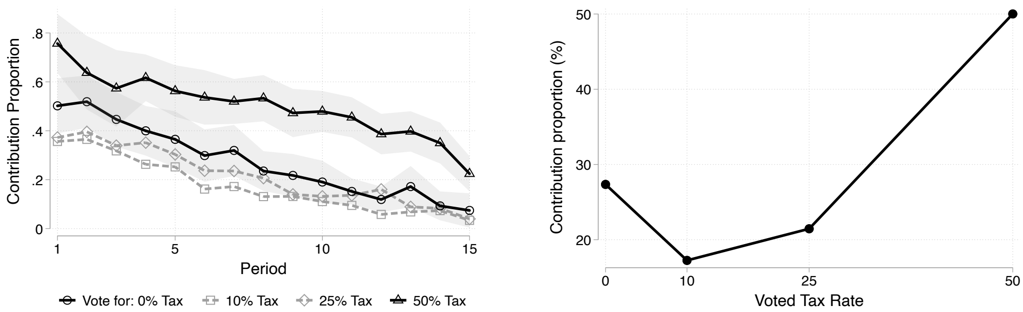
Table 5: Redistribution Preferences Predict Voting and Contributions

	Voted Tax (Endo Only) *Multinomial Logit*		**Contribution (Endo + Exo)** *Tobit*	
	(1)	(2)	(3)	(4)
Meritocratic	0.727^{**}	0.706^{*}	0.0785^{*}	0.104^{**}
(Baseline: Libertarian)	(0.364)	(0.363)	(0.0409)	(0.0411)
Egalitarian	0.450	0.671	-0.0270	-0.0281
	(0.721)	(0.599)	(0.105)	(0.0994)
Period	0.141^{***}	0.141^{***}	-0.0271^{***}	-0.0270^{***}
	(0.0218)	(0.0218)	(0.00198)	(0.00197)
Constant	3.504^{***}	3.188^{***}		
	(0.704)	(0.660)		
Individual characteristics	No	Yes	No	Yes
Observations	840	840	5040	5040

Notes. This table examines how redistribution preferences predict tax voting and contribution behavior. Redistribution preferences are classified based on post-experimental survey responses (see Section 2.3). Columns 1–2: Random effects ordered logit regressions predicting voted tax rate (0%, 10%, 25%, 50%) in Endo treatments only; 168 subjects × 5 voting rounds = 840 observations. Columns 3–4: Tobit regressions predicting contribution share (censored at 0 and 1) in pooled Endo and Exo treatments; 336 subjects × 15 periods = 5,040 observations. Baseline preference category: *Libertarian.* Individual characteristics (columns 2 and 4): age, gender, risk preferences, lab experience, major, education, and siblings. Robust standard errors clustered at the individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5 presents regression evidence. Columns 1-2 analyze voted tax rates using multinomial logit models using data from Endo treatments; columns 3-4 analyze contribution proportions using tobit models using data from both the Endo and Exo treatments. The reference category is the libertarian preference type. Meritocratic participants vote for significantly higher taxes than libertarian participants (coefficient 0.706-0.727, $p < 0.10$ in the full model) and contribute approximately 10.4 percentage points more of their endowment ($p < 0.05$). Preferences predict contribution behavior irrespective of voting behavior, meaning meritocratic individuals are not merely voting for redistribution out of strategic self-interest; they are also intrinsically more cooperative.

Figure 8 displays the relationship between voted tax rates and contributions in the Endo treatments. Panel (a) shows contributions over time grouped by which tax rate participants voted for in the most recent voting round; panel (b) shows the average contributions depending on the voted tax rate. Panel (a) shows that participants who voted for 50% tax consistently contribute the highest proportions throughout the experiment. Panel (b) reveals a J-shaped aggregate relationship. Participants voting for 0% tax contribute 29% on average, those voting for intermediate rates (10% or 25%) contribute around 22-23%, while those voting for 50% contribute 46% on average, substantially more than any other group.[5] We also examine the relationship between realized tax rates and contribution proportions in the Exogenous treatment, where tax rates are randomly imposed rather than voted upon (Appendix Figure A1). Here, contributions vary only minimally across tax rates as the tax rate increases from 0% to 50% suggesting that the effect we observe in Endo is mainly driven by sorting.[6]



(a) Contribution by Period and Voted Tax

(b) Contribution by Voted Tax

Figure 8: Average contribution proportion by voted tax rate in Endogenous Tax treatments

Notes. Panel (a): Contribution proportions over 15 periods, grouped by the tax rate participants voted for in the most recent voting round. Shaded area represents 95% confidence interval for 0% and 50% votes. Panel (b): Average contribution proportion by voted tax rate. Data pooled across Homo and Hetero conditions.

Second, we further examine the signaling effects of voting on contributions. Participants receive feedback on the number of votes casted on each possible tax rate before they make contribution decisions in the next 3 periods when the voted tax rate is applied. To the extent that voting and contributions are correlated, these voting outcomes are informative about other group members' cooperative inclinations. We regress individual contributions in Endo on the average tax rate voted on by the other three group members (see Table A6 in the Appendix). To remove the effect of the tax rate that was chosen for implementation by the random dictator rule, we control for that tax

[5]Regression analysis (Appendix Table A5) confirms these patterns: in Endo, compared to 0% voters, those voting for 10% or 25% contribute about 8 percentage points less ($p < 0.01$), while 50% voters contribute about 20 percentage points more ($p < 0.01$).

[6]Table A5 suggests the same pattern. In Exo, experiencing a 50% tax rate significantly increases contributions by 8%-points relative to the experience of 0% tax rate, a much smaller effect than in Endo. The impact of 10% tax is weakly positive, while the impact 25% is not statistically significantly different from a 0% tax rate.

rate in the regression in column 1, and, in addition, we exclude that tax rate from the computation of the average tax rate voted on in column 2. If there is no signaling effect, the voted on, but not implemented, average tax rate should have no effect on the contributions. We find, both in columns 1 and 2, that the average voted tax rate has a significant and positive effect on contributions providing evidence for the signaling value of votes.

3.4.3 Initial Endowments

A separate source of heterogeneity arises from initial endowment differences in the Hetero treatments. We examine how rich (initial endowment = 40) and poor (initial endowment = 20) participants differ in contribution behavior.

Result 8 (Initial Endowment Effects)**.** *There are no statistically significant differences between contribution proportions of rich and poor participants. Poor participants contribute significantly more than the Homo baseline in Endo and Exo-50.*

Support comes from Tables 6, Figure A2 and Table A9. We begin with average contribution levels, then examine temporal dynamics. Table 6 reports individual-level average contribution proportions (proportion of endowment contributed across all 15 periods) for rich, poor, and Homo participants in each tax treatment.

Table 6: Average Contribution Proportion by Initial Endowment and Tax Treatment

	Poor (20)	**Rich (40)**	**Homo (30)**	**Rich vs. Poor**
NoTax	44.7 vs. Homo: $p = 0.579$	38.7 vs. Homo: $p = 0.067^{*}$	46.6	$p = 0.198$
Endo	**38.9** vs. Homo: $p = 0.040^{**}$	33.3 vs. Homo: $p = 0.820$	31.1	$p = 0.172$
Exo	36.4 vs. Homo: $p = 0.465$	37.2 vs. Homo: $p = 0.845$	34.7	$p = 0.663$
Exo-50	**58.4** vs. Homo: $p = 0.006^{***}$	48.1 vs. Homo: $p = 0.698$	37.4	$p = 0.173$

Notes: Individual-level average contribution proportions (%) computed over all 15 periods. Each cell shows the mean contribution proportion for that group and the p-value from Mann-Whitney test comparing against Homo baseline. Final column reports Rich vs. Poor comparison p-value. Sample sizes: NoTax (Poor: 48, Rich: 48, Homo: 72); Endo (Poor: 48, Rich: 48, Homo: 72); Exo (Poor: 48, Rich: 48, Homo: 72); Exo-50 (Poor: 36, Rich: 36, Homo: 72). Significance: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Two striking patterns emerge. First, direct rich-poor comparisons are *not* statistically significant in any treatment (all $p > 0.17$). When averaged over all 15 periods, rich and poor participants contribute similar shares of their endowments within each tax regime. Second, the poor contribute significantly more than the Homo baseline in specific institutional contexts, most clearly in Exo-50, but also in Endo. Appendix Figure A2 displays the temporal evolution of contribution proportions, showing convergence in contributions by the rich and poor. Regression analysis, supporting the same idea, can be found in Appendix Table A9.

4 Conclusions and Discussion

In this paper, we investigated the effects of tax regimes and initial endowment disparities on growth and inequality, utilizing a dynamic public good game to capture the accumulative nature of wealth. We find that redistribution through taxtion curtails inequality. Irrespective of the institutional detail, final round inequality is lower in any treatment with taxation compared to the NoTax treatment. We also find that redistribution is not necessarily harmful to growth. In fact, if initial inequality is high, then a persistent high amount of redistribution (as in Exo-50) can lead to higher final wealth compared to NoTax. Also in the treatments with varying tax rates, contributions are higher for a high tax rate (50%) compared to lower tax rates. Participants appear to understand the benefits of a higher tax rate and (in Endo) increasingly vote in favour of higher taxes over time.

These results point to a subtle interplay and to the necessity of careful institutional design. In particular, redistribution through taxation can significantly lower wealth, but it can also lead to lower inequality and avoid extreme low growth, compared to the case of no taxation. As different regimes differ not only in means but in the distribution of outcomes, there is a question of how to aggregate welfare and compare across institutions. For example, the stable high-tax regime (*Exo-50*) eliminated the "worst-case" outcomes (low wealth/high inequality). By contrast, the NoTax baseline, while achieving very high wealth in some groups also had 40% of the groups ending up with low wealth and high inequality.

Reflecting on our theoretical model, we find that the sequential equilibrium better captures the initially high and declining contributions we observed, and positive growth in the dynamic public good game, compared to subgame-perfect Nash equilibrium. The sequential equilibrium also better captures that initial endowment inequality is washed out and does not matter in the long run. However, the sequential equilibrium imposes symmetry assumptions that mean it cannot capture the endogenously emerging inequality we observed that stems from unequal contributions to the public good. It thus, cannot capture the inequality-reducing impact of taxes either. In addition, sequential equilibrium suggested taxes would reduce growth, while we find experimentally that high, consistently applied taxes support growth, especially when the initial conditions are unequal. Hence, a behaviorally motivated alternative theoretical model would need to capture heterogeneity in the willingness to contribute to the public good, as well as, in redistribution preferences. It would be of interest to see if such a model could account for our finding that people are motivated to contribute more to the public good when inequality is lower, which generates growth when taxes are high.

Our study is not without limitations, which point to fruitful avenues for future research. First, to incentivize truthful revelation of preferences, we employed a random dictator voting mechanism. While this design choice allows for clean identification of individual preferences, future research should examine whether these results hold under majority voting rules. Appendix Table A7 shows how different tax rates would have been had we used majority voting instead of the random dictator rule. Focusing on the 156 cases (74% of votes) where a clear majority preference exists, we find that the two mechanisms produce very similar tax rates. In 62.8% of the cases (98/156) majority voting would have selected the exact same tax rate as our random dictator rule did. In addition, there are 54 instances with true ties (e.g., 2-2 or 1-1-1-1 vote splits), where no clear majority exists and a random tie-breaking rule would effectively lead to the random dictator rule. Further, the mean tax rate under random dictator is 27.7% compared to 28.0% under majority rule, a difference of 0.3 percentage points that is not statistically significant ($p = 0.870$).

Overall, our results highlight the importance of studying public good provision problems from a dynamic perspective as long-run results may substantially differ from those obtained in static frameworks.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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A Theoretical Framework

A.1 Game definition

Let $I = \{1, 2, 3, 4\}$ be the set of 4 players in a group. A history h is a complete record of all past contribution decisions (and tax rates) observed up to a given period in the game while a path is a sequence of game histories. We denote the set of histories by H and the set of paths by P. In treatments without tax, the game starts with a contribution in period 1 h_1^c, and gives rise to a path $(h_1^c, h_2^c, ..., h_T^c)$. In the treatments with tax, the path consists of a sequence of contribution and tax histories: $(h_1^z, h_1^c, h_2^z, h_2^c, ..., h_T^z, h_T^c)$.

Let A_i^h be the set of actions of player i at history h. In treatments without tax and with exogenous tax, the set of actions equals the set of contributions: $A_i^h := C_i^h := \{0, 1, ..., N_i^h\}$ where N_i^h denotes the budget of i upon reaching history h, which depends on the accumulated wealth of player i in history h. In treatments with endogenous taxation, individuals also choose a tax rate from the set of 0, 10, 25, 50 percent in every third period of the game starting with period 1. The set of actions for a history h is given by $A_i^h := C_i^h \times Z_i^h := \{0, 0.1, 0.25, 0.5\}$

The set of i's strategies is $A_i := \Pi_{h \in H} A_i^h$ and the set of strategy profiles is $A := \Pi_{i \in I} A_i$. For an arbitrary $a \in A$, let $c_i^h(a)$ be i's contribution at the history $h \in H$ and $z_i^h(a)$ be the tax rate chosen by i. An arbitrary strategy profile $a \in A$ induces a unique path $P(a)$. In treatments without taxation and with exogenous taxation, the observed actions along $P(a)$ are denoted by $(c_i^1(a), c_i^2(a), ..., c_i^T(a))$. In the treatments with endogenous taxation, they are denoted by $(c_i^1(a), z_i^1(a), c_i^2(a), z_i^2(a)..., z_i^T(a), c_i^T(a))$, consisting of contribution and tax rate choices.

Payoffs without tax rates. Fix an arbitrary strategy profile $a \in A$, and take each player i's observed contributions $(c_i^1(a), c_i^2(a), ..., c_i^T(a))$ along the realized path $P(a)$. For each $t \geq 1$, the budget of individual i is given by:

$$N_i^{t+1} = N_i^t - c_i^t(a) + \frac{r}{4} \sum_{j=1}^{4} c_j^t(a)$$

with $N_i^1 = 30$ for all i in the homogeneous treatments, and $N_i^1 = 20$ for $i = 1, 2$ and $N_i^i = 40$ for $i = 3, 4$ in the heterogeneous treatments. The payoff function of individual i is $u_i : A \to R$, which equals the budget after the last period:

$$u_i(a) = N_i^{T+1}$$

In treatments with taxation, the budget depends on the tax rate as well as the redistributed tax revenue:

$$N_i^{t+1} = (1-\tau)\left(N_i^t - c_i^t(a) + \frac{r}{4}\sum_{j=1}^{4} c_j^t(a)\right) + \frac{1}{4}\sum_{k=1}^{4}\tau\left(N_k^t - c_k^t(a) + \frac{r}{4}\sum_{j=1}^{4} c_j^t(a)\right)$$

Again:

$$u_i(a) = N_i^{T+1}$$

In all games, we say that a strategy $a_i \in A_i$ is a best response to $a_{-i} \in A_{-i}$, and we write $a_i \in BR_i(a_{-i})$, whenever

$$u_i(a_i, a_{-i}) \geq u_i(b_i, a_{-i}) \quad \text{for all } b_i \in A_i.$$

The strategy profile $a = (a_i)_{i \in I}$ is a Nash equilibrium (NE) whenever $a_i \in BR_i(a_{-i})$ for every $i \in I$.

Likewise, in all games, we say that a strategy $a_i \in A_i$ is a best response to $a_{-i} \in A_{-i}$ conditionally on h, and we write $a_i \in BR_i(a_{-i}|h)$,

$$u_i(a_i, a_{-i}|h) \geq u_i(b_i, a_{-i}|h) \qquad \text{for all } b_i \in A_i.$$

The strategy profile $a = (a_i)_{i \in I}$ is a Subgame-Perfect Nash Equilibrium (SPNE) whenever $a_i \in BR_i(a_{-i}|h)$ for every $i \in I$ and every $h \in H$.

A.2 Subgame-perfect Nash equilibrium

Our first proposition extends the SPNE results obtained in Gächter et al. (2017) to the case with taxation.

Proposition 1. *Consider all treatments of the dynamic public good game with growth as defined in the main body of the paper. The unique subgame-perfect Nash equilibrium (SPNE) is such that every player contributes 0 at every history, i.e., if $a \in A$ is an SPNE, then*

$$c_i^h(a) = 0 \quad \textit{for every } i \in I \quad \textit{and for all } h \in H.$$

Proof. We rely on the standard backward induction argument. Let $a \in A$ be an SPNE strategy profile. Then, it suffices to prove that for an arbitrary history $h \in H$, $c_i^h(a) = 0$ for $\forall i$. Assume that this is not the case, that is, assume that there is some $i \in I$ such that $c_i^h(a) > 0$. Take another strategy $b_i \in A$, such that $c_i^{h'}(b_i, a_{-i}) = c_i^{h'}(a)$ at every $h' \neq h$, moreover $c_i^h(b_i, a_{-i}) = 0$. This implies that $c_j^{h''}(a) = c_j^{h''}(b_i, a_{-i})$ for all $h'' \in H$ and therefore i's payoff at the end of the game only depends on her payoff after history h. Then for any tax rate τ including $\tau = 0$:

$$
\begin{aligned}
u_i(a|h) = (1-\tau)\left(N_i^h - c_i^h(a) + \frac{r}{4}\sum_{j=1}^{4} c_j^h(a)\right) + \frac{1}{4}\sum_{k=1}^{4}\tau\left(N_k^t - c_k^t(a) + \frac{r}{4}\sum_{j=1}^{4} c_j^t(a)\right) \\
< (1-\tau)\left(N_i^h + \frac{r}{4}\sum_{j\neq i}^{4} c_j^h(a)\right) + \frac{\tau}{4}N_i^h + \frac{1}{4}\sum_{k\neq i}^{4}\tau\left(N_k^h - c_k^h(a) + \frac{r}{4}\sum_{j\neq i}^{4} c_j^h(a)\right) \\
= (1-\tau)\left(N_i^h - c_i^h(b_i,a_{-i}) + \frac{r}{4}\sum_{j=1}^{4} c_j^h(b_i,a_{-i})\right) + \frac{1}{4}\sum_{k=1}^{4}\tau\left(N_k^t - c_k^t(b_i,a_{-i}) + \frac{r}{4}\sum_{j=1}^{4} c_j^t(b_i,a_{-i})\right) \\
= u_i(b_i,a_{-i}|h) \quad (2)
\end{aligned}
$$

which implies that $a_i \notin BR_i(a_{-i}|h)$ and therefore a is not an SPNE, which contradicts the hypothesis made above. Hence, $c_i^h(a) = 0$ for all $i \in I$ and all $h \in H$, which completes the proof. □

The fact that individuals contribute zero to the public good in the SPNE implies the following results.

Corollary 1. *Proposition 1 implies that*

1. *There is no growth in all treatments (independently of the level of taxes);*
2. *Inequality is higher in the treatments with heterogenous initial endowments compared to those with homogeneous initial endowments;*
3. *Taxes will reduce inequality in treatments with heterogeneous initial endowments and have no effect in treatments with homogeneous initial endowments;*
4. *When initial endowments are heterogeneous, the rich (those with $N_i^1 = 40$) will vote for zero tax rate, while the poor (those with $N_i^1 = 20$) will vote for 50% tax rate.*

A.3 Sequential equilibrium

While the SPNE gives sharp results, it cannot explain positive contributions in the public good game and the implications of it for inequality and growth. We thus follow Gächter et al. (2017) to consider the sequential equilibrium in a game with tit-for-tat types following Kreps et al. (1982). We show that individuals have an incentive to fully contribute for a number of periods in the finitely repeated dynamic public good game with growth.

We describe the setting as follows. We assume that at the start of the game, a player $i \in I$ believes with probability δ that every individual follows a tit-for-tat (TFT) strategy, and with probability $1-\delta$ that every individual is rational. Rational types contribute zero, while TFT types contribute their full endowment in period 1, and in later periods, they aim to match the minimum proportional contribution chosen by other individuals in the group at the previous history h_{t-1}:

$$a_i^{h_t} \in arg \min_{a_i \in A_i^{h_t}} \left| \frac{a_i}{N_i^{h_t}} - \min_{j \neq i} \frac{a_j^{h_{t-1}}}{N_j^{h_{t-1}}} \right|$$

In subsequent periods, individuals update their beliefs. At each history that is consistent with all individuals having played according to TFT so far, individuals keep the probabilistic beliefs as in period 1. However, if at least one individual has deviated from TFT, player i updates and believes that all individuals are rational with probability 1 and thus stop contributing. Seeing no contribution, the deviating player i will also update beliefs. Contributions thus return to zero.

We can show that this setting gives rise to a sequential equilibrium in which individuals cooperate for a while by contributing their full endowment in the first t periods, after which they contribute zero. We analyze the homogeneous and heterogeneous initial endowment cases together because full contribution in period 1 eliminates the impact of initial endowment differences. This is because in the treatments with heterogeneous initial endowments, the payoffs at the end of period 1 will be the same for everyone and equal to $r\frac{N_L+N_H}{2}$, which is also equal to the full cooperation payoff of the homogeneous initial endowment treatment at the end of period 1. This observation holds independently of the tax rate.

We prove the following proposition for any tax rates τ (potentially $\tau = 0$).

Proposition 2. *Consider all treatments of the dynamic public good game with growth as in the main body of the paper. Fix an arbitrary symmetric sequential equilibrium and let $(h_1, h_2, ..., h_T)$ be the equilibrium path. Then, there is some $t \in \{1, 2, ..., T\}$, such that every rational player contributes the full endowment N_i^h at the first t histories, and 0 in the remaining histories $h \in \{h_{t+1}, h_{t+2}, ...h_T\}$.*

Proof. Consider history h_t such that so far everyone has contributed their full endowment and thus their current endowment is $N_i^{h_t} = r^t N_i^{h_1}$, for all i. Since nobody has deviated yet, everyone believes that others' type is TFT with probability δ and rational with probability $1 - \delta$.

Then consider the payoffs of a rational player i who first contributes zero, while everyone else still contributes their full endowment. The deviation by i will induce others to update their beliefs and contribute zero after the next period, which means that there will be no further growth and the endowments remain constant. The payoffs of this case as the function of the tax rate τ are equal to:

$$U_i^R(\tau) = (1-\tau)\left(N_i^{h_t} + \frac{r}{4}3N_i^{h_t}\right) + \frac{\tau}{4}\left(4N_i^{h_t} - 3N_i^{h_t} + r3N_i^{h_t}\right) = N_i^{h_t} + (r-\tau)\frac{3}{4}N_i^{h_t}$$

We can see that this payoff decreases in the tax rate τ.

In contrast, continuing the TFT strategy will result in the following payoffs. With probability δ everyone fully contributes including i which leads to growth for the next K periods. With probability $1-\delta$ others are rational thus contribute zero, while only player i contributes full. This leads to the updating of beliefs after the next period and everyone contribute zero from then on, leading to no growth. The resulting payoff is:

$$U_i^{TFT}(\tau) = \delta r^K N_i^{h_t} + (1-\delta)A(\tau, N_i^{h_t})$$

where

$$A(\tau, N_i^{h_t}) = (1-\tau)\frac{r}{4} r N_i^{h_t} + \frac{\tau}{4}\left(3rN_i^{h_t} + \frac{3r^2}{4}N_i^{h_t} + \frac{r^2}{4}N_i^{h_t}\right) = \frac{1}{4}(r^2 N_i^{h_t} + 3r\tau N_i^{h_t})$$

where $A'(\tau) > 0$, thus the TFT payoffs increase in the tax rate. Note that for $\tau = 0$, we obtain the same formulas as in Proposition 8 of Gächter et al. (2017).

The TFT strategy is beneficial if $U_i^R(\tau) < U_i^{TFT}(\tau)$. At the indifference point, we obtain that the length of cooperation periods K is equal to:

$$K^*(\tau) = \log_r\left(\frac{N_i^{h_t} + (r-\tau)\frac{3}{4}N_i^{h_t} - (1-\delta)A(\tau, N_i^{h_t})}{\delta N_i^{h_t}}\right)$$

with $K'(\tau) < 0$. □

We can see that the length of cooperation is shorter when the tax rate is higher, which gives rise to the following corollary.

Corollary 2. *Proposition 2 implies that:*

- *Initial endowment inequality has no impact on the long-run wealth and inequality.*
- *A higher tax rate leads to shorter spell of cooperation and lower final wealth, while it has no impact on the level of inequality.*
- *Individuals have incentives to vote for the lowest tax rate of 0%.*

B Additional Tables

Table A1: Wealth, Inequality, and Contributions by Initial Endowment Condition

	NoTax	Endo	Exo	Exo-50
Wealth (median)				
Homo	545.0 (160.7)	225.9 (86.8)	319.2 (100.3)	364.7 (136.4)
Hetero	411.5 (115.4)	263.5 (98.4)	288.1 (121.2)	703.8 (307.3)
Gini Coefficient				
Homo	0.11	0.07	0.07	0.03
Hetero	0.14	0.09	0.08	0.05
Contribution Proportion				
Homo	0.45	0.30	0.34	0.36
Hetero	0.40	0.35	0.35	0.51
Permutation tests Homo vs Hetero (p-values)				
Wealth	0.538	0.763	0.829	0.163
Gini coeff.	0.241	0.534	0.656	0.008
Contribution proportion	0.593	0.490	0.830	0.099

Notes. This table reports the same statistics as Table 2 separated by initial endowment condition (Homo = homogeneous; Hetero = heterogeneous).

Table A2: Contributions, Wealth, and Inequality in First Three Periods Only

	NoTax	Endo	Exo	Exo-50
Contributions (Proportion)				
Mean (Median)	0.56 (0.54)	0.45 (0.45)	0.48 (0.43)	0.61 (0.62)
Wealth				
Mean (Median)	39.5 (39.3)	37.7 (36.9)	38.6 (38.2)	40.4 (40.9)
Gini Coefficient				
Mean (Median)	0.11 (0.12)	0.11 (0.11)	0.10 (0.09)	0.06 (0.06)
Permutation tests (p-values)				
Contribution	NoTax vs. Var-Tax: $p = 0.008$;		NoTax vs. Exo-50: $p = 0.318$	
Wealth	NoTax vs. Var-Tax: $p = 0.019$;		NoTax vs. Exo-50: $p = 0.196$	
Gini	NoTax vs. Var-Tax: $p = 0.176$;		NoTax vs. Exo-50: $p < 0.001$	

Notes. Average contributions, wealth and Gini coefficient for periods 1-3 only. Contributions are measured by the proportion of endowment contributed to the group account. Wealth is measured as average payoff per period. The Gini coefficient measures within-group inequality. Unit of observation: group level; 162 groups of four participants. Numbers in parentheses report median values. Data pooled across Homo and Hetero initial endowment conditions. "Var-Tax" refers to pooled Endo and Exo treatments with variable tax rates; Exo-50 tested separately as it has a constant 50% tax rate. Permutation tests use group-level averages.

Table A3: Contribution Proportions by Experimental Half and Tax Regime

	First Half	Second Half	Difference	Decay Rate (%)
Contributions (proportion share of endowment)				
NoTax	0.518	0.369	-0.149***	-28.8
Endo	0.411	0.277	-0.134***	-32.6
Exo	0.431	0.296	-0.135***	-31.3
Exo-50	0.553	0.366	-0.187***	-33.8

Notes. The table reports average contribution proportions in the first half (Periods 1–7) and second half (Periods 8–15). Data are pooled across homogeneous and heterogeneous endowment conditions. "Difference" is Half 2 minus Half 1. Statistical significance is based on permutation tests. $^{***}p < 0.01$.

Table A5: Tax Rate and Contributions in EndoTax and ExoTax Treatments: Tobit Models

Dep Var: contribution proportion	(1) EndoTax	(2) ExoTax	(3) EndoTax	(4) ExoTax
Panel a. Individual voted tax rate (baseline: 0% tax):				
ivote=10	-0.0971**		-0.0605	
	(0.0483)		(0.0449)	
ivote=25	-0.0789		-0.0591	
	(0.0517)		(0.0524)	
ivote=50	0.233***		0.212***	
	(0.0603)		(0.0585)	
Constant	0.322***		0.620*	
	(0.0439)		(0.331)	
Wald test for linear restrictions				
Coef(ivote=10) = Coef(ivote=50)	<0.01		<0.01	
Coef(ivote=25) = Coef(ivote=50)	<0.01		<0.01	
Panel b. Group tax rate: (baseline: 0% tax)				
tax rate=10	-0.0563	0.0840**	-0.0574	0.0679*
	(0.0434)	(0.0400)	(0.0410)	(0.0373)
tax rate=25	-0.106**	0.0181	-0.0977**	0.0297
	(0.0491)	(0.0461)	(0.0471)	(0.0432)
tax rate=50	0.212***	0.0772**	0.190***	0.0848**
	(0.0538)	(0.0370)	(0.0496)	(0.0347)
Constant	0.269***	0.292***	0.536	-0.526
	(0.0426)	(0.0345)	(0.351)	(0.483)
Wald test for linear restrictions (p-values reported)				
Coef(ivote=10) = Coef(ivote=50)	<0.01	0.865	<0.01	0.663
Coef(ivote=25) = Coef(ivote=50)	<0.01	0.179	<0.01	0.187
Observations	2520	2520	2520	2520
Controls for individual characteristics			✓	✓

Notes. This table uses Tobit models to examine the influence of tax rate on contributions (measured by contribution proportion). Columns 1 & 3 focus on EndoTax treatment, while columns 2 & 4 focus on ExoTax treatment. Robust standard errors, clustered at the subject level, are presented in parentheses. Adjustments for additional personal attributes, including age, gender, educational attainment, economics major status, only-child status, laboratory experience, self-assessed mathematical confidence, risk-taking tendencies, and prosocial behavior, are incorporated in Columns 3 & 4. The top panel's independent variable is the individually voted tax rate ('ivote'), while the bottom panel's is the group tax rate ('tax rate'). The Wald test evaluates whether the coefficient associated with *ivote=10 or 25* is equal to that of *ivote=50*. A p-value less than 0.01 indicates strong evidence against the null hypothesis of equal coefficients.

Table A4: Contribution Proportion across Treatments: Tobit Models

	(1)	(2)	(3)
Homo-EndoTax	-0.190***	-0.148**	-0.229***
(Baseline: Homo-NoTax)	(0.0708)	(0.0677)	(0.0734)
Homo-ExogTax	-0.168**	-0.125*	-0.251***
	(0.0743)	(0.0718)	(0.0743)
Homo-Exo50Tax	-0.118	-0.107	-0.0932
	(0.0720)	(0.0690)	(0.0770)
Hete-NoTax	-0.0695	-0.0395	-0.0959
	(0.0748)	(0.0724)	(0.0776)
Hete-EndoTax	-0.129*	-0.110	-0.195**
	(0.0691)	(0.0673)	(0.0774)
Hete-ExogTax	-0.129*	-0.0951	-0.141**
	(0.0665)	(0.0636)	(0.0690)
Hete-Exo50Tax	0.127	0.144*	0.119
	(0.0845)	(0.0806)	(0.0925)
Period	-0.0320***	-0.0318***	-0.0383***
	(0.00160)	(0.00159)	(0.00461)
Homo-EndoTax × Period			0.0102*
			(0.00596)
Homo-ExogTax × Period			0.0159**
			(0.00629)
Homo-Exo50Tax × Period			-0.00181
			(0.00664)
Hete-NoTax × Period			0.00709
			(0.00597)
Hete-EndoTax × Period			0.0106*
			(0.00640)
Hete-ExogTax × Period			0.00578
			(0.00583)
Hete-Exo50Tax × Period			0.00308
			(0.00696)
Constant	0.739***	0.724***	0.777***
	(0.0570)	(0.269)	(0.272)
Individual characteristics	No	Yes	Yes
Observations	9720	9720	9720

Wald tests of linear combinations (p-values)	
NoTax vs. Endo (pooled)	$p = 0.002$
NoTax vs. Exo (pooled)	$p = 0.003$
NoTax vs. Exo-50 (pooled)	$p = 0.310$

Notes. Tobit panel regressions with contribution proportion as dependent variable (censored at 0 and 1). Unit of observation: individual-period (periods 1-15). Sample: 648 subjects (Homo-NoTax: 72; Homo-Endo/Exo/Exo50: 72 each; Hete-NoTax: 96; Hete-Endo/Exo: 96 each; Hete-Exo50: 72), yielding 9,720 individual-period observations. Baseline: Homo-NoTax. Robust standard errors clustered at subject level in parentheses. Individual characteristics (columns 2-3): age, gender, education, economics major, siblings, lab experience, math confidence, domain-specific risk-taking (DomSpeRT), and prosociality. Treatment × Period interactions (column 3) capture treatment-specific time trends. Wald tests compare pooled NoTax treatments (Homo-NoTax + Hete-NoTax) against pooled treatment groups: (Homo-Endo + Hete-Endo), (Homo-Exo + Hete-Exo), and (Homo-Exo50 + Hete-Exo50). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A6: Signaling Effect on Contributions

	(1) contribution proportion Tobit	(2) contribution proportion Tobit
Average voted on tax rate by others	0.0101***	
	(0.00180)	
Average voted on tax rate by others (excluding implemented tax rate)		0.00671***
		(0.00120)
Implemented tax rate = 10%	-0.126***	-0.0921**
	(0.0425)	(0.0429)
Implemented tax rate = 25%	-0.126***	-0.0419
	(0.0444)	(0.0444)
Implemented tax rate = 50%	0.197***	0.364***
	(0.0456)	(0.0501)
Period	-0.0508***	-0.0508***
	(0.00382)	(0.00382)
Hetero	0.0632	0.0632
	(0.0506)	(0.0506)
Constant	0.463***	0.463***
	(0.0580)	(0.0580)
Observations	2520	2520

Notes: Tobit regressions predicting contribution proportion in the Endo treatments (Hetero and Homo). Robust standard errors clustered at the individual level in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$.

Table A7: Voting Mechanism Comparison: Random Dictator vs. Majority Rule (Excluding Ties)

Tax Rate	Random Dictator (%)	Majority Rule (%)	Difference (pp)
0%	22.4	19.2	−3.2
10%	20.5	25.0	+4.5
25%	11.5	9.6	−1.9
50%	45.5	46.2	+0.6
Mean tax rate	27.7	28.0	+0.3

Notes: This table compares tax rate distributions after excluding 54 voting instances (25.7%) with true ties (2-2 or 1-1-1-1 vote splits). Sample: 156 group-period observations with clear plurality or majority. Agreement rate: 62.8% (98/156). Paired t-test comparing mean tax rates: $t = -0.164$, $p = 0.870$. Wilcoxon signed-rank test: $z = -0.052$, $p = 0.958$. pp = percentage points.

Table A8: Contribution Proportions by Voted and Realized Tax Rate

Panel A: All Periods			
Tax rate (%)	ExoTax (realized)	EndoTax (voted)	EndoTax (realized)
0	0.338	0.290	0.301
10	0.370	0.222	0.250
25	0.331	0.232	0.205
50	0.377	0.464	0.450
Total	0.359	0.340	0.340
Panel B: Periods 1–3			
Tax rate (%)	ExoTax (realized)	EndoTax (voted)	EndoTax (realized)
0	0.436	0.489	0.456
10	0.443	0.346	0.363
25	0.480	0.369	0.356
50	0.638	0.656	0.678
Total	0.482	0.446	0.446

Notes: Entries report mean contribution proportions by voted (realized) tax rate in Endo-Tax (Exo-Tax) treatment. Periods 1–3 capture early-stage behavior before substantial dynamic adjustment.

Table A9: The Effect of Initial Endowment Disparity on Voting and Contributions

	(1) Voted Tax	(2) Contribution Proportion
Rich	-13.84***	-0.204***
	(3.856)	(0.0568)
Period	1.007***	-0.0403***
	(0.317)	(0.00346)
Rich × Period	0.240	0.0162***
	(0.432)	(0.00430)
Constant	24.56***	0.781***
	(3.116)	(0.0461)
Observations	480	5400

Notes. This table examines the impact of initial endowment disparity on voting and contributions in Heterogeneous treatments. Column 1: Random effects linear regression predicting voted tax rate (0, 10, 25, or 50) in Endo-Hetero treatment; 96 subjects × 5 voting rounds = 480 observations. Column 2: Tobit regression predicting contribution proportion (censored at 0 and 1) across all Heterogeneous treatments (NoTax-Hetero, Endo-Hetero, Exo-Hetero, Exo50-Hetero); 360 subjects × 15 periods = 5,400 observations. "Rich" is a dummy variable equal to 1 for participants with initial endowment of 40 (baseline: initial endowment of 20). Robust standard errors clustered at the individual level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C Additional Figures

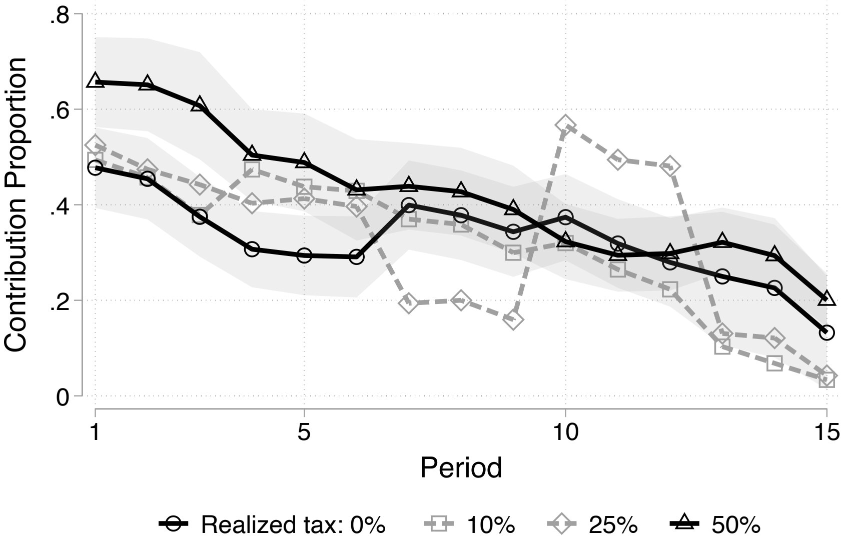

Figure A1: Contribution Trends by Realized Tax Rate in Exogenous Tax Treatments

Notes. This figure reports the average contribution proportion across periods in the Exogenous Tax treatments, separated by the randomly realized group tax rate. Unlike the Endogenous treatments (where higher voted taxes clearly separated high contributors), the contribution patterns here are intertwined and relatively flat across different tax rates. This indicates that when tax rates are exogenously imposed rather than voted upon, they do not serve as an effective signal for conditional cooperation. A summary table of the tax rate and contribution proportion can be seen in Table A8.

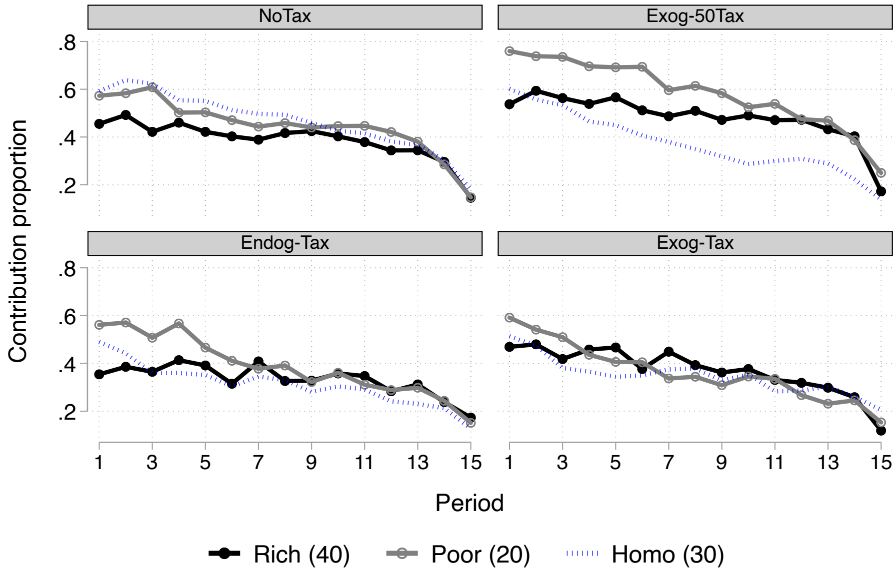

Figure A2: Contribution proportion by Initial Endowment Over Time

Notes. Contribution proportions (share of endowment allocated to group account) over 15 periods in Hetero treatments, separated by initial endowment: Rich (endowment=40, dashed line) and Poor (endowment=20, solid line). Each panel represents a different tax regime. Homo contributions (endowment=30, dash-dot line) shown for comparison. Observe the gap between rich and poor in early periods and the convergence by period 15 across all treatments.

D Experimental Instructions

D.1 Homogeneous-NoTax

You are about to participate in a decision making experiment. If you follow the instructions carefully, you can earn a considerable amount of money depending on your decisions and the decisions of the other participants. Your earnings will be paid to you in cash at the end of the experiment.

This set of instructions is for your private use only. **During the experiment you are not allowed to communicate with anybody.** In case of questions, please raise your hand. Then we will come to your seat and answer your questions. Any violation of this rule excludes you immediately from the experiment and all payments.

Throughout the experiment you will make decisions about amounts of **tokens**. At the end of the experiment all tokens you have will be converted into RMBs at the exchange rate **0.05 RMB for 1 token** and paid you in cash in addition to the **participation fee of 15 RMBs**.

During the experiment all your decisions will be treated confidentially. This means that none of the other participants will know which decisions you made.

Experimental Instructions

The experiment will consist of **15 decision making periods**. At the beginning of the experiment, you will be matched with **3** other people in this room. Therefore, there are **4** people, including yourself, participating in your **group**. You will be matched with the **same** people during the entire experiment. **None of the participants knows who is in which group**.

Before the first period you, and each other person in your group, will be given the endowment of **30 tokens**.

At the beginning of the first period you will be asked to allocate your endowment between a **private account** and a **group account**.

The tokens that you place in the **private account** have a **return of 1** at the end of the first period. This means that at the end of the first period your private account will contain exactly the amount of tokens you put into the private account at the beginning of the period. **Nobody except yourself benefits from your private account**.

The tokens that you place in the **group account** are summed together with the tokens that the other three members of your group place in the group account. The tokens in the group account have a **return of 1.5**. **Every member of the group benefits equally from the**

group account. Specifically, the total amount of tokens placed in the group account by all group members is multiplied by 1.5 and then is equally divided among the four group members. Hence, your **share** of the group account at the end of the first period is

1.5 * (sum of tokens in the group account) / 4

Your payoff at the end of the first period will be equal to the amount of tokens contained in your private account at the end of the first period **plus** your share of the group account at the end of the first period.

At the beginning of the second period, your endowment will be your payoff from the end of the first period. Then, you will be again asked to **allocate your endowment** between a **private account** and a **group account**. Both the private and the group accounts work in exactly the same manner as in the first period, namely, they have the same returns.

The structure of the experiment at all subsequent periods is identical: your endowment at the beginning of each period is equal to your payoff from the end of the previous period.

At the end of each period, you will be **informed** about:

- The endowment all four group members had at the beginning of the period.
- How much each group member allocated to the group account and to their respective private accounts.
- Your share of the group account (remember it is the same for all group members).
- You and other group members' payoff at the end of the period.

All other participants will receive exactly the same information.

Your **total income at the end of the experiment** is equal to your payoff **at the end of period 15**.

At the end of the experiment, there will be a brief survey, please fill it out carefully for a chance to receive an additional 5 yuan reward.

This is the end of the instructions. If you have any questions please raise your hand and an experimenter will come by to answer them.

D.2 Homogeneous-EndoTax

You are about to participate in a decision making experiment. If you follow the instructions carefully, you can earn a considerable amount of money depending on your decisions and the decisions of the other participants. Your earnings will be paid to you in cash at the end of the experiment.

This set of instructions is for your private use only. **During the experiment you are not allowed to communicate with anybody.** In case of questions, please raise your hand. Then we will come to your seat and answer your questions. Any violation of this rule excludes you immediately from the experiment and all payments.

Throughout the experiment you will make decisions about amounts of **tokens**. At the end of the experiment all tokens you have will be converted into RMBs at the exchange rate **0.05 RMB for 1 token** and paid you in cash in addition to the **participation fee of 15 RMBs**.

During the experiment all your decisions will be treated confidentially. This means that none of the other participants will know which decisions you made.

Experimental Instructions

The experiment will consist of **15 decision making periods**. At the beginning of the experiment, you will be matched with **3** other people in this room. Therefore, there are **4** people, including yourself, participating in your **group**. You will be matched with the **same** people during the entire experiment. **None of the participants knows who is in which group**.

Before the first period you, and each other person in your group, will be given the endowment of **30 tokens**.

At the beginning of the first period you will be asked to allocate your endowment between a **private account** and a **group account**.

The tokens that you place in the **private account** have a **return of 1** at the end of the first period. This means that at the end of the first period your private account will contain exactly the amount of tokens you put into the private account at the beginning of the period. **Nobody except yourself benefits from your private account**.

The tokens that you place in the **group account** are summed together with the tokens that the other three members of your group place in the group account. The tokens in the group account have a **return of 1.5**. **Every member of the group benefits equally from the group account**. Specifically, the total amount of tokens placed in the group account by all group members is multiplied by 1.5 and then is equally divided among the four group members. Hence, your **share** of the group account at the end of the first period is

1.5 * (sum of tokens in the group account) / 4

Your payoff before tax at the end of the first period will be equal to the amount of tokens contained in your private account at the end of the first period **plus** your share of the group account at the end of the first period.

Tax Payments

All group members will **pay a tax on their payoff**. The tax rate may be 0%, 10%, 25% or 50%. Below we will explain how the tax rate is determined. Hence,

Taxes paid = Tax rate * payoff before tax

The sum of all taxes paid within the group will then be equally divided among the four group members. You will receive the following

Allocation = 1/4 * Sum of taxes paid by all group members

The resulting **after tax-payoff** will be computed as follows:

After tax payoff = payoff before tax – taxes paid + allocation

At the beginning of the second period, your endowment will be your after-tax payoff from the end of the first period. Then, you will be again asked to **allocate your endowment** between a **private account** and a **group account**. Both the private and the group accounts work in exactly the same manner as in the first period, namely, they have the same returns.

The structure of the experiment at all subsequent periods is identical: your endowment at the beginning of each period is equal to your after-tax payoff from the end of the previous period.

At the end of each period, you will be **informed** about:

- The endowment all four group members had at the beginning of the period.
- How much each group member allocated to the group account and to their respective private accounts.
- Your share of the group account (remember it is the same for all group members).
- The tax rate.
- You and other group members' before-tax and after-tax payoffs at the end of the period.

The tax rate will be determined as follows. At the beginning of period 1, each group member will be asked to state their **most preferred tax** rate among the possible values of 0%, 10%, 25% and 50%. Then, a group member will be **randomly selected** and their most preferred tax rate will be the tax rate for all group members in period 1, 2, and 3. The thus selected tax rate will be made public for all group members. The same procedure will be repeated before period 4, 7, 10, 13. Each time the determined tax rate will be applied to the 3 following periods, including the period before which the tax rate was determined.

All other participants will receive exactly the same information.

Your **total income at the end of the experiment** is equal to your payoff **at the end of period 15**.

At the end of the experiment, there will be a brief survey, please fill it out carefully for a chance to receive an additional 5 yuan reward.

This is the end of the instructions. If you have any questions please raise your hand and an experimenter will come by to answer them.

D.3 Homogeneous-ExoTax

You are about to participate in a decision making experiment. If you follow the instructions carefully, you can earn a considerable amount of money depending on your decisions and the decisions of the other participants. Your earnings will be paid to you in cash at the end of the experiment.

This set of instructions is for your private use only. **During the experiment you are not allowed to communicate with anybody.** In case of questions, please raise your hand. Then we will come to your seat and answer your questions. Any violation of this rule excludes you immediately from the experiment and all payments.

Throughout the experiment you will make decisions about amounts of **tokens**. At the end of the experiment all tokens you have will be converted into RMBs at the exchange rate **0.05 RMB for 1 token** and paid you in cash in addition to the **participation fee of 15 RMBs**.

During the experiment all your decisions will be treated confidentially. This means that none of the other participants will know which decisions you made.

Experimental Instructions

The experiment will consist of **15 decision making periods**. At the beginning of the experiment, you will be matched with **3** other people in this room. Therefore, there are **4** people, including yourself, participating in your **group**. You will be matched with the **same** people during the entire experiment. **None of the participants knows who is in which group**.

Before the first period you, and each other person in your group, will be given the endowment of **30 tokens**.

At the beginning of the first period you will be asked to allocate your endowment between a **private account** and a **group account**.

The tokens that you place in the **private account** have a **return of 1** at the end of the first period. This means that at the end of the first period your private account will contain exactly the amount of tokens you put into the private account at the beginning of the period. **Nobody except yourself benefits from your private account**.

The tokens that you place in the **group account** are summed together with the tokens that the other three members of your group place in the group account. The tokens in the group account have a **return of 1.5**. **Every member of the group benefits equally from the group account**. Specifically, the total amount of tokens placed in the group account by all group members is multiplied by 1.5 and then is equally divided among the four group members. Hence, your **share** of the group account at the end of the first period is

1.5 * (sum of tokens in the group account) / 4

Your payoff before tax at the end of the first period will be equal to the amount of tokens contained in your private account at the end of the first period **plus** your share of the group account at the end of the first period.

Tax Payments

All group members will **pay a tax on their payoff**. The tax rate may be 0%, 10%, 25% or 50%. Below we will explain how the tax rate is determined. Hence,

Taxes paid = Tax rate * payoff before tax

The sum of all taxes paid within the group will then be equally divided among the four group members. You will receive the following

Allocation = 1/4 * Sum of taxes paid by all group members

The resulting **after tax-payoff** will be computed as follows:

After tax payoff = payoff before tax − taxes paid + allocation

At the beginning of the second period, your endowment will be your after-tax payoff from the end of the first period. Then, you will be again asked to **allocate your endowment** between a **private account** and a **group account**. Both the private and the group accounts work in exactly the same manner as in the first period, namely, they have the same returns.

The structure of the experiment at all subsequent periods is identical: your endowment at the beginning of each period is equal to your after-tax payoff from the end of the previous period.

At the end of each period, you will be **informed** about:

- The endowment all four group members had at the beginning of the period.
- How much each group member allocated to the group account and to their respective private accounts.
- Your share of the group account (remember it is the same for all group members).
- The tax rate.
- You and other group members' before-tax and after-tax payoffs at the end of the period.

The tax rate will be determined as follows. At the beginning of period 1, the computer will randomly select a tax rate among the possible values of 0%, 10%, 25% and 50% according to **pre-set probabilities**. The randomly selected tax rate will be the tax rate for all group members in period 1, 2, and 3. The thus selected tax rate will be made public for all group members. The same procedure will be repeated before period 4, 7, 10, 13. Each time the determined tax rate will be applied to the 3 following periods, including the period before which the tax rate was determined.

The pre-set probabilities that the computer uses for the random draw are based on the behavior of participant in previous experimental sessions, in which participants chose the tax rate by voting. The pre-set probabilities may vary across the periods.

Preferred tax: We will also ask you about your preferred tax during these periods. However please note that the tax option you choose will NOT be implemented for real. The question is ONLY to check your tax preference.

All other participants will receive exactly the same information.

Your **total income at the end of the experiment** is equal to your payoff **at the end of period 15**.

At the end of the experiment, there will be a brief survey, please fill it out carefully for a chance to receive an additional 5 yuan reward.

This is the end of the instructions. If you have any questions please raise your hand and an experimenter will come by to answer them.

D.4 Homogeneous-Exo50Tax

You are about to participate in a decision making experiment. If you follow the instructions carefully, you can earn a considerable amount of money depending on your decisions and the decisions of the other participants. Your earnings will be paid to you in cash at the end of the experiment.

This set of instructions is for your private use only. **During the experiment you are not allowed to communicate with anybody.** In case of questions, please raise your hand. Then we will come to your seat and answer your questions. Any violation of this rule excludes you immediately from the experiment and all payments.

Throughout the experiment you will make decisions about amounts of **tokens**. At the end of the experiment all tokens you have will be converted into RMBs at the exchange rate **0.05 RMB for 1 token** and paid you in cash in addition to the **participation fee of 15 RMBs**.

During the experiment all your decisions will be treated confidentially. This means that none of the other participants will know which decisions you made.

Experimental Instructions

The experiment will consist of **15 decision making periods**. At the beginning of the experiment, you will be matched with **3** other people in this room. Therefore, there are **4** people, including yourself, participating in your **group**. You will be matched with the **same** people during the entire experiment. **None of the participants knows who is in which group**.

Before the first period you, and each other person in your group, will be given the endowment of **30 tokens**.

At the beginning of the first period you will be asked to allocate your endowment between a **private account** and a **group account**.

The tokens that you place in the **private account** have a **return of 1** at the end of the first period. This means that at the end of the first period your private account will contain exactly the amount of tokens you put into the private account at the beginning of the period. **Nobody except yourself benefits from your private account**.

The tokens that you place in the **group account** are summed together with the tokens that the other three members of your group place in the group account. The tokens in the group account have a **return of 1.5**. **Every member of the group benefits equally from the group account**. Specifically, the total amount of tokens placed in the group account by all group members is multiplied by 1.5 and then is equally divided among the four group members. Hence, your **share** of the group account at the end of the first period is

1.5 * (sum of tokens in the group account) / 4

Your payoff before tax at the end of the first period will be equal to the amount of tokens contained in your private account at the end of the first period **plus** your share of the group account at the end of the first period.

Tax Payments

All group members will **pay a tax on their payoff**. The tax rate is **50% for all 15 periods** of the experiment. This tax rate applies to all group members throughout the entire experiment. Hence, the tax you paid is as the following:

Taxes paid = 50% * payoff before tax

The sum of all taxes paid within the group will then be equally divided among the four group members. You will receive the following

Allocation = 1/4 * Sum of taxes paid by all group members

The resulting **after tax-payoff** will be computed as follows:

After tax payoff = payoff before tax − taxes paid + allocation

At the beginning of the second period, your endowment will be your after-tax payoff from the end of the first period. Then, you will be again asked to **allocate your endowment** between a **private account** and a **group account**. Both the private and the group accounts work in exactly the same manner as in the first period, namely, they have the same returns.

The structure of the experiment at all subsequent periods is identical: your endowment at the beginning of each period is equal to your after-tax payoff from the end of the previous period.

At the end of each period, you will be **informed** about:

- The endowment all four group members had at the beginning of the period.

- How much each group member allocated to the group account and to their respective private accounts.
- Your share of the group account (remember it is the same for all group members).
- The tax rate.
- You and other group members' before-tax and after-tax payoffs at the end of the period.

All other participants will receive exactly the same information.

Your **total income at the end of the experiment** is equal to your payoff **at the end of period 15**.

At the end of the experiment, there will be a brief survey, please fill it out carefully for a chance to receive an additional 5 yuan reward.

This is the end of the instructions. If you have any questions please raise your hand and an experimenter will come by to answer them.

D.5 Heterogeneous-NoTax

You are about to participate in a decision making experiment. If you follow the instructions carefully, you can earn a considerable amount of money depending on your decisions and the decisions of the other participants. Your earnings will be paid to you in cash at the end of the experiment.

This set of instructions is for your private use only. **During the experiment you are not allowed to communicate with anybody.** In case of questions, please raise your hand. Then we will come to your seat and answer your questions. Any violation of this rule excludes you immediately from the experiment and all payments.

Throughout the experiment you will make decisions about amounts of **tokens**. At the end of the experiment all tokens you have will be converted into RMBs at the exchange rate **0.05 RMB for 1 token** and paid you in cash in addition to the **participation fee of 15 RMBs**.

During the experiment all your decisions will be treated confidentially. This means that none of the other participants will know which decisions you made.

Experimental Instructions

The experiment will consist of **15 decision making periods**. At the beginning of the experiment, you will be matched with **3** other people in this room. Therefore, there are **4** people, including yourself, participating in your **group**. You will be matched with the **same** people during the entire experiment. **None of the participants knows who is in which group**.

Before the first period you, and each other person in your group, will be given an endowment. Two group members will be given **20 tokens**, the other two group members will be given **40 tokens** as endowment. The exact allocation of the tokens among the group members will be randomly determined by the computer. You will be informed about your endowment at the beginning of the experiment.

At the beginning of the first period you will be asked to allocate your endowment between a **private account** and a **group account**.

The tokens that you place in the **private account** have a **return of 1** at the end of the first period. This means that at the end of the first period your private account will contain exactly the amount of tokens you put into the private account at the beginning of the period. **Nobody except yourself benefits from your private account**.

The tokens that you place in the **group account** are summed together with the tokens that the other three members of your group place in the group account. The tokens in the group account have a **return of 1.5**. **Every member of the group benefits equally from the group account**. Specifically, the total amount of tokens placed in the group account by all group members is multiplied by 1.5 and then is equally divided among the four group members. Hence, your **share** of the group account at the end of the first period is

1.5 * (sum of tokens in the group account) / 4

Your payoff at the end of the first period will be equal to the amount of tokens contained in your private account at the end of the first period **plus** your share of the group account at the end of the first period.

At the beginning of the second period, your endowment will be your payoff from the end of the first period. Then, you will be again asked to **allocate your endowment** between a **private account** and a **group account**. Both the private and the group accounts work in exactly the same manner as in the first period, namely, they have the same returns.

The structure of the experiment at all subsequent periods is identical: your endowment at the beginning of each period is equal to your payoff from the end of the previous period.

At the end of each period, you will be **informed** about:

- The endowment all four group members had at the beginning of the period.

- How much each group member allocated to the group account and to their respective private accounts.
- Your share of the group account (remember it is the same for all group members).
- You and other group members' payoff at the end of the period.

All other participants will receive exactly the same information.

Your **total income at the end of the experiment** is equal to your payoff **at the end of period 15**.

At the end of the experiment, there will be a brief survey, please fill it out carefully for a chance to receive an additional 5 yuan reward.

This is the end of the instructions. If you have any questions please raise your hand and an experimenter will come by to answer them.

D.6 Heterogeneous-EndoTax

You are about to participate in a decision making experiment. If you follow the instructions carefully, you can earn a considerable amount of money depending on your decisions and the decisions of the other participants. Your earnings will be paid to you in cash at the end of the experiment.

This set of instructions is for your private use only. **During the experiment you are not allowed to communicate with anybody.** In case of questions, please raise your hand. Then we will come to your seat and answer your questions. Any violation of this rule excludes you immediately from the experiment and all payments.

Throughout the experiment you will make decisions about amounts of **tokens**. At the end of the experiment all tokens you have will be converted into RMBs at the exchange rate **0.05 RMB for 1 token** and paid you in cash in addition to the **participation fee of 15 RMBs**.

During the experiment all your decisions will be treated confidentially. This means that none of the other participants will know which decisions you made.

Experimental Instructions

The experiment will consist of **15 decision making periods**. At the beginning of the experiment, you will be matched with **3** other people in this room. Therefore, there are **4** people, including yourself, participating in your **group**. You will be matched with the **same** people during the entire experiment. **None of the participants knows who is in which group**.

Before the first period you, and each other person in your group, will be given an endowment. Two group members will be given **20 tokens**, the other two group members will be given **40 tokens** as endowment. The exact allocation of the tokens among the group members will be randomly determined by the computer. You will be informed about your endowment at the beginning of the experiment.

At the beginning of the first period you will be asked to allocate your endowment between a **private account** and a **group account**.

The tokens that you place in the **private account** have a **return of 1** at the end of the first period. This means that at the end of the first period your private account will contain exactly the amount of tokens you put into the private account at the beginning of the period. **Nobody except yourself benefits from your private account**.

The tokens that you place in the **group account** are summed together with the tokens that the other three members of your group place in the group account. The tokens in the group account have a **return of 1.5**. **Every member of the group benefits equally from the group account**. Specifically, the total amount of tokens placed in the group account by all group members is multiplied by 1.5 and then is equally divided among the four group members. Hence, your **share** of the group account at the end of the first period is

1.5 * (sum of tokens in the group account) / 4

Your payoff before tax at the end of the first period will be equal to the amount of tokens contained in your private account at the end of the first period **plus** your share of the group account at the end of the first period.

Tax Payments

All group members will **pay a tax on their payoff**. The tax rate may be 0%, 10%, 25% or 50%. Below we will explain how the tax rate is determined. Hence,

Taxes paid = Tax rate * payoff before tax

The sum of all taxes paid within the group will then be equally divided among the four group members. You will receive the following

Allocation = 1/4 * Sum of taxes paid by all group members

The resulting **after tax-payoff** will be computed as follows:

After tax payoff = payoff before tax − taxes paid + allocation

At the beginning of the second period, your endowment will be your after-tax payoff from the end of the first period. Then, you will be again asked to **allocate your endowment** between a **private account** and a **group account**. Both the private and the group accounts work in exactly the same manner as in the first period, namely, they have the same returns.

The structure of the experiment at all subsequent periods is identical: your endowment at the beginning of each period is equal to your after-tax payoff from the end of the previous period.

At the end of each period, you will be **informed** about:

- The endowment all four group members had at the beginning of the period.
- How much each group member allocated to the group account and to their respective private accounts.
- Your share of the group account (remember it is the same for all group members).
- The tax rate.
- You and other group members' before-tax and after-tax payoffs at the end of the period.

The tax rate will be determined as follows. At the beginning of period 1, each group member will be asked to state their **most preferred tax** rate among the possible values of 0%, 10%, 25% and 50%. Then, a group member will be **randomly selected** and their most preferred tax rate will be the tax rate for all group members in period 1, 2, and 3. The thus selected tax rate will be made public for all group members. The same procedure will be repeated before period 4, 7, 10, 13. Each time the determined tax rate will be applied to the 3 following periods, including the period before which the tax rate was determined.

All other participants will receive exactly the same information.

Your **total income at the end of the experiment** is equal to your payoff **at the end of period 15**.

At the end of the experiment, there will be a brief survey, please fill it out carefully for a chance to receive an additional 5 yuan reward.

This is the end of the instructions. If you have any questions please raise your hand and an experimenter will come by to answer them.

D.7 Heterogeneous-ExoTax

You are about to participate in a decision making experiment. If you follow the instructions carefully, you can earn a considerable amount of money depending on your decisions and the decisions of the other participants. Your earnings will be paid to you in cash at the end of the experiment.

This set of instructions is for your private use only. **During the experiment you are not allowed to communicate with anybody.** In case of questions, please raise your hand. Then we will come to your seat and answer your questions. Any violation of this rule excludes you immediately from the experiment and all payments.

Throughout the experiment you will make decisions about amounts of **tokens**. At the end of the experiment all tokens you have will be converted into RMBs at the exchange rate **0.05 RMB for 1 token** and paid you in cash in addition to the **participation fee of 15 RMBs**.

During the experiment all your decisions will be treated confidentially. This means that none of the other participants will know which decisions you made.

Experimental Instructions

The experiment will consist of **15 decision making periods**. At the beginning of the experiment, you will be matched with **3** other people in this room. Therefore, there are **4** people, including yourself, participating in your **group**. You will be matched with the **same** people during the entire experiment. **None of the participants knows who is in which group**.

Before the first period you, and each other person in your group, will be given an endowment. Two group members will be given **20 tokens**, the other two group members will be given **40 tokens** as endowment. The exact allocation of the tokens among the group members will be randomly determined by the computer. You will be informed about your endowment at the beginning of the experiment.

At the beginning of the first period you will be asked to allocate your endowment between a **private account** and a **group account**.

The tokens that you place in the **private account** have a **return of 1** at the end of the first period. This means that at the end of the first period your private account will contain exactly the amount of tokens you put into the private account at the beginning of the period. **Nobody except yourself benefits from your private account**.

The tokens that you place in the **group account** are summed together with the tokens that the other three members of your group place in the group account. The tokens in the group account have a **return of 1.5**. **Every member of the group benefits equally from the group account**. Specifically, the total amount of tokens placed in the group account by all group members is multiplied by 1.5 and then is equally divided among the four group members. Hence, your **share** of the group account at the end of the first period is

1.5 * (sum of tokens in the group account) / 4

Your payoff before tax at the end of the first period will be equal to the amount of tokens contained in your private account at the end of the first period **plus** your share of the group account at the end of the first period.

Tax Payments

All group members will **pay a tax on their payoff**. The tax rate may be 0%, 10%, 25% or 50%. Below we will explain how the tax rate is determined. Hence,

Taxes paid = Tax rate * payoff before tax

The sum of all taxes paid within the group will then be equally divided among the four group members. You will receive the following

Allocation = 1/4 * Sum of taxes paid by all group members

The resulting **after tax-payoff** will be computed as follows:

After tax payoff = payoff before tax – taxes paid + allocation

At the beginning of the second period, your endowment will be your after-tax payoff from the end of the first period. Then, you will be again asked to **allocate your endowment** between a **private account** and a **group account**. Both the private and the group accounts work in exactly the same manner as in the first period, namely, they have the same returns.

The structure of the experiment at all subsequent periods is identical: your endowment at the beginning of each period is equal to your after-tax payoff from the end of the previous period.

At the end of each period, you will be **informed** about:

- The endowment all four group members had at the beginning of the period.
- How much each group member allocated to the group account and to their respective private accounts.
- Your share of the group account (remember it is the same for all group members).

- The tax rate.
- You and other group members' before-tax and after-tax payoffs at the end of the period.

The tax rate will be determined as follows. At the beginning of period 1, the computer will randomly select a tax rate among the possible values of 0%, 10%, 25% and 50% according to **pre-set probabilities**. The randomly selected tax rate will be the tax rate for all group members in period 1, 2, and 3. The thus selected tax rate will be made public for all group members. The same procedure will be repeated before period 4, 7, 10, 13. Each time the determined tax rate will be applied to the 3 following periods, including the period before which the tax rate was determined.

The pre-set probabilities that the computer uses for the random draw are based on the behavior of participant in previous experimental sessions, in which participants chose the tax rate by voting. The pre-set probabilities may vary across the periods.

Preferred tax: We will also ask you about your preferred tax during these periods. However please note that the tax option you choose will NOT be implemented for real. The question is ONLY to check your tax preference.

All other participants will receive exactly the same information.

Your **total income at the end of the experiment** is equal to your payoff **at the end of period 15**.

At the end of the experiment, there will be a brief survey, please fill it out carefully for a chance to receive an additional 5 yuan reward.

This is the end of the instructions. If you have any questions please raise your hand and an experimenter will come by to answer them.

D.8 Heterogeneous-Exo50Tax

You are about to participate in a decision making experiment. If you follow the instructions carefully, you can earn a considerable amount of money depending on your decisions and the decisions of the other participants. Your earnings will be paid to you in cash at the end of the experiment.

This set of instructions is for your private use only. **During the experiment you are not allowed to communicate with anybody.** In case of questions, please raise your hand. Then we will come to your seat and answer your questions. Any violation of this rule excludes you immediately from the experiment and all payments.

Throughout the experiment you will make decisions about amounts of **tokens**. At the end of the experiment all tokens you have will be converted into RMBs at the exchange rate **0.05 RMB for 1 token** and paid you in cash in addition to the **participation fee of 15 RMBs**.

During the experiment all your decisions will be treated confidentially. This means that none of the other participants will know which decisions you made.

Experimental Instructions

The experiment will consist of **15 decision making periods**. At the beginning of the experiment, you will be matched with **3** other people in this room. Therefore, there are **4** people, including yourself, participating in your **group**. You will be matched with the **same** people during the entire experiment. **None of the participants knows who is in which group**.

Before the first period you, and each other person in your group, will be given an endowment. Two group members will be given **20 tokens**, the other two group members will be given **40 tokens** as endowment. The exact allocation of the tokens among the group members will be randomly determined by the computer. You will be informed about your endowment at the beginning of the experiment.

At the beginning of the first period you will be asked to allocate your endowment between a **private account** and a **group account**.

The tokens that you place in the **private account** have a **return of 1** at the end of the first period. This means that at the end of the first period your private account will contain exactly the amount of tokens you put into the private account at the beginning of the period. **Nobody except yourself benefits from your private account**.

The tokens that you place in the **group account** are summed together with the tokens that the other three members of your group place in the group account. The tokens in the group account have a **return of 1.5**. **Every member of the group benefits equally from the group account**. Specifically, the total amount of tokens placed in the group account by all group members is multiplied by 1.5 and then is equally divided among the four group members. Hence, your **share** of the group account at the end of the first period is

1.5 * (sum of tokens in the group account) / 4

Your payoff before tax at the end of the first period will be equal to the amount of tokens contained in your private account at the end of the first period **plus** your share of the group account at the end of the first period.

Tax Payments

All group members will **pay a tax on their payoff**. The tax rate is **50% for all 15 periods** of the experiment. This tax rate applies to all group members throughout the entire experiment. Hence, the tax you paid is as the following:

Taxes paid = 50% * payoff before tax

The sum of all taxes paid within the group will then be equally divided among the four group members. You will receive the following

Allocation = 1/4 * Sum of taxes paid by all group members

The resulting **after tax-payoff** will be computed as follows:

After tax payoff = payoff before tax − taxes paid + allocation

At the beginning of the second period, your endowment will be your after-tax payoff from the end of the first period. Then, you will be again asked to **allocate your endowment** between a **private account** and a **group account**. Both the private and the group accounts work in exactly the same manner as in the first period, namely, they have the same returns.

The structure of the experiment at all subsequent periods is identical: your endowment at the beginning of each period is equal to your after-tax payoff from the end of the previous period.

At the end of each period, you will be **informed** about:

- The endowment all four group members had at the beginning of the period.
- How much each group member allocated to the group account and to their respective private accounts.
- Your share of the group account (remember it is the same for all group members).
- The tax rate.
- You and other group members' before-tax and after-tax payoffs at the end of the period.

All other participants will receive exactly the same information.

Your **total income at the end of the experiment** is equal to your payoff **at the end of period 15**.

At the end of the experiment, there will be a brief survey, please fill it out carefully for a chance to receive an additional 5 yuan reward.

This is the end of the instructions. If you have any questions please raise your hand and an experimenter will come by to answer them.

E Post-experiment questionnaires

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Please answer the following survey questions. Your answers will be used for this study only. Individual data will not be released. You will get an additional 5 yuan if you answer all the survey questions carefully.

1. What is your age?
2. What is your gender? (Male/Female)
3. What is your education level? (Undergraduate/Postgraduate/PhD/Others)
4. What is your academic program/major?
5. Are you registered in Economic and Management School? (Yes/No)
6. How many siblings do you have? (No Siblings/1/2 or above)
7. How many times have you participated in CBER experiments? (Never/Less than 5/ 5 to 10/ More than 10)
8. Do you consider yourself good at mathematics? (Yes/No)

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1. On a scale from 1 to 10, please rate, prior to this study, how familiar you were with the group project task that was used in the experiment.

2. Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Rate yourself from 1 to 10, where 1 means 'unwilling to take any risk' and 10 means 'fully prepared to take risks'.

3. On a scale from 1-10, how strongly do you agree with the following statement:
"In this experiment, it is fair to tax people with high income."
"Lower inequality will tend to lead to higher contributions to the group account."
"Higher taxes will encourage people to contribute more to the group account."

[*Endogenous tax treatment only*]
4. What is the most important factor that affects your decision on the tax rate level?
(a) My current income.

(b) Income of my group members.

(c) The income disparity between my other group members and myself.

(d) The income disparity between the highest- and the lowest-income group members in my group.

(f) Others. Please specify here:

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Please indicate how you would place your views on the following scale (1 means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right).

Q1	Income should be made more equal.					There should be greater incentives for individual effort.				
	1	2	3	4	5	6	7	8	9	10
Q2	Government ownership of business and industry should be increased.					Private ownership of business and industry should be increased.				
	1	2	3	4	5	6	7	8	9	10
Q3	Government should take more responsibility to ensure that everyone is provided for.					People should take more responsibility to provide for themselves.				
	1	2	3	4	5	6	7	8	9	10
Q4	Competition is harmful.					Competition is good.				
	1	2	3	4	5	6	7	8	9	10
Q5	Hard work doesn't generally bring success- it's more a matter of luck and connections.					In the long run, hard work usually brings a better life.				
	1	2	3	4	5	6	7	8	9	10

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Please imagine the following scenarios and state what you would like to do.

Imagine you are a chief executive officer (CEO) of a company, and your company recruited two interns recently: A and B.

Scenario 1: A and B were told by human resources (HR) that only one of them will be paid a salary of 600 yuan, and the other will get nothing from the internship. And they were told who will get the salary will be determined by a random lottery (e.g flipping a coin). Now you were told that intern A would get the 600. Would you like to redistribute the income between A and B?

Please select the income distribution you would like to enforce between the two interns.

A: 600 / B: 0 A: 500 / B: 100 A: 400 / B: 200 A: 300 / B: 300 A: 200 / B: 400 A: 100 / B: 500 A: 0 / B: 600

Scenario 2: A and B were told by human resources (HR) that only one of them will be paid a salary of 600 yuan, and the other will get nothing from the internship. A's performance during the internship was better than that of B's.

Now you were told that intern A would get the 600 based on the performance. Would you like to redistribute the income between A and B?

Please select the income distribution you would like to enforce between the two interns.

A: 600 / B: 0 A: 500 / B: 100 A: 400 / B: 200 A: 300 / B: 300 A: 200 / B: 400 A: 100 / B: 500 A: 0 / B: 600

Scenario 3: A and B were told by human resources (HR) that only one of them will be paid a salary of 600 yuan, and the other will get nothing from the internship. And they were told who will get the salary will be determined by a random lottery (e.g flipping a coin).

Now you were told that intern A would get the 600. However, due to company policy, any redistribution will induce cost on the lucky player (in this case intern A) twice as much as the transferred income. Would you like to redistribute the income between A and B?

Please select the income distribution you would like to enforce between the two interns.

A: 600 / B: 0 A: 400 / B: 100 A: 200 / B: 200 A: 0 / B: 300

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For each of the following statements, please indicate the likelihood that you would engage in the activity or behavior described if you were to find yourself in that situation. Provide a rating from "extremely unlikely" to "extremely likely" using the following scale:

1. Admit that your tastes are different from those of a friend.
2. Donate blood.
3. Disagree with an authority figure on a major issue.
4. Participate in volunteer activities for a long time.
5. Choose an occupation that you truly enjoy over a more secure one.
6. Speak your mind about an unpopular issue in a meeting at work.
7. Donate money if you see that a patient cannot be treated because of a lack of money.
8. Give your seat to an old, weak, sick or pregnant person on a bus or metro.