Supplementary Materials for:
Resource Allocations and Disapproval Voting in Unequal Groups

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Contents

1 Formal model of representative and receiver behavior[1]

1.1 Standard preferences and undominated equilibria

In this appendix we formulate and formally prove theoretical statements which inform some of the hypotheses formulated in the main text. Throughout we assume common knowledge of rationality, which is a necessary assumption for formulating our game theoretic results. For simplicity we also assume complete information. Although, this assumption is unlikely to be met in the laboratory it is often invoked in the applied game theoretic literature because it considerably simplifies the analysis and often also reduces the number of equilibria, which in turn makes the predictions sharper. For some of the hypotheses in the main text we will have to deviate from this assumption, which we discuss there. We do not necessarily assume standard preferences, that is, we do not restrict our analysis to narrow selfish preferences. Nevertheless, to set a benchmark, in the following we shall start out with assuming standard preferences.

First, we shall show that in our game there is a multiplicity of subgame perfect Nash equilibria (SPNE) (Nash, 1950; Selten, 1965). Specifically, we show that *any* proposal by the representative R can be supported as a SPNE outcome. However, many of these equilibria are in (weakly) dominated strategies. That is, roughly, in strategies for which from the individual player's perspective, there exist (weakly) preferred alternative strategies if the given equilibrium would not be played. We then show for general utility functions that in our game we can make the game theoretic predictions much sharper when concentrating on SPNE that do not involve (weakly) dominated strategies. Specifically, we show that in our game there is always exactly one SPNE that is not weakly dominated. We then apply this result to our game with standard preferences. Thereafter, we analyze our game separately for the private and common information treatments assuming generalized preferences that allow for social comparisons regarding the outcome of the game (see, e.g., Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000).

Proposition 1. SPNE WITH STANDARD PREFERENCES
Assume that all players only care about their own material well-being. Then, each allocation $(x^*_R, x^*_{M1}, x^*_{M2}, x^*_L)$ *with* $x^*_R + x^*_{M1} + x^*_{M2} + x^*_L = 200$ *can be supported by a SPNE (in pure strategies).*

Proof:

1. Note that in the voting subgame, for all receivers $M1, M2, L$ it is a NE strategy to vote against disapproval if the representative offers exactly $(x^*_R, x^*_{M1}, x^*_{M2}, x^*_L)$ and to vote in favor of disapproval otherwise. This strategy combination forms a NE in the subgame because if all three receivers vote against (or in favor) of disapproval the majority rule implies that a unilateral deviation of any receiver does not change the outcome and, hence, payoffs.

2. Given the described NE in the voting subgame it follows that for any proposal $(x^*_R, x^*_{M1}, x^*_{M2}, x^*_L)$ the representative cannot do better by deviating because this leads to all three receivers voting in favor of disapproval. If not disapproved the representative earns $200 + x^*_R$, when deviating to another allocation $(x_R, x_{M1}, x_{M2}, x_L)$ and, hence, being disapproved the representative earns $200 + x_R - 200 = x_R$. Thus deviation is profitable iff $x_R > 200 + x^*_R$ which is impossible for any $x^*_R \geq 0$.

QED

This is an unsatisfactory result, because it implies that the game theoretic prediction is uninformative regarding expected behavior. However, note that the equilibrium described in the proof of Proposition 1

[1] In this Supplementary Materials we refer to group members who can vote for or against disapproval as 'receivers'. In the paper they are called 'villagers' for convenience.

is in weakly dominated strategies. In particular, receivers' strategies are weakly dominated by always voting against disapproval. To see this, observe that, for any given allocation $(x_R, x_{M1}, x_{M2}, x_L) \neq (x_R^*, x_{M1}^*, x_{M2}^*, x_L^*)$, when following the prescription to vote in favor of disapproval a receiver i earns x_i when the other receivers both vote against disapproval and $x_i - 20$ when at least one of them votes in favor of disapproval. On the other hand, always voting against disapproval achieves the same payoffs when the other receivers either both vote against or in favor of disapproval, and a higher payoff, namely x_i instead of $x_i - 20$, when only one other receiver votes against (or in favor) of disapproval. Hence, the latter strategy does never worse than the former strategy and is strictly better for one strategy combination of the other receivers. Thus the strategy to vote always against disapproval weakly dominates the strategy described in (the proof of) Proposition 1.

In the following we show that focusing on equilibria in undominated strategies considerably narrows the set of SPNE and allows for sharp predictions. In the following we denote a strategy of a player i by σ_i. For the representative, σ_R prescribes the proposal vector $(x_R, x_{M1}, x_{M2}, x_L)$ he makes and for each receiver, $i = M1, M2, L$, σ_i prescribes to vote either N_i, against disapproval, or Y_i, in favor of disapproval. In the following we do not assume narrow material selfish preferences. We only make the usual assumption that all players' preferences can be represented by a well-defined von Neumann-Morgenstern utility function u_i.

Lemma 1. Voting game NE in undominated strategies
The strategy combinations $(\sigma_{M1}^*, \sigma_{M2}^*, \sigma_L^*)$ where each receiver votes in favor of disapproval iff she would be better off with than without disapproval is the (generically) unique undominated NE in the voting subgame for all possible proposals $(x_R, x_{M1}, x_{M2}, x_L)$ (i.e, on and off the equilibrium path).

Proof: Let $\sigma_i (i = M1, M2, L)$ be a (pure) strategy of receiver i. Note that in the voting subgame, i.e., for given allocations $(x_R, x_{M1}, x_{M2}, x_L)$, the only payoff relevant states for receivers are whether disapproval takes place or not. Therefore, for determining the NE we can focus on the payoff consequences in these two states. Let σ_i^* be given by

$$\sigma_i^* = \begin{cases} Y_i & \text{if } (x_R, x_{M1}, x_{M2}, x_L) \text{ is such that } u_i(dis) > u_i(no\ dis) \\ N_i & \text{if } (x_R, x_{M1}, x_{M2}, x_L) \text{ is such that } u_i(dis) \leq u_i(no\ dis), \end{cases}$$

where dis ($no\ dis$) stands for the case where a majority of receivers, including i, votes for (against) disapproval. To show that all receivers playing σ_i^* is a NE we have to show that no unilateral deviation (in pure strategies) makes any of the receivers better off. If a player is not pivotal then – due to the majority rule – a unilateral deviation does not increase (neither decrease) the deviating receiver's utility. Hence, we can focus on deviations where she is pivotal. Then, deviating from Y_i to N_i in case of $u_i(dis) > u_i(no\ dis)$ changes the voting outcome from dis to $no\ dis$, which makes her worse off. Similarly, deviating from N_i to Y_i in case of $u_i(dis) \leq u_i(no\ dis)$ changes the voting outcome from $no\ dis$ to dis, which does not make her better off.

Is this equilibrium undominated? It suffices to show that σ_i^* is undominated by any other pure strategy σ_i for all i. Another pure strategy could possibly dominate σ_i^* only if it leads to a higher payoff for at least one of the possible strategy combinations of the other two receivers. Since, in the voting game the utility of a player is determined solely by the voting outcome we can concentrate on how the other receivers' strategies affect these outcomes (instead of on the individual strategies). It follows from the definition of σ_i^* that none of these alternative strategies can do strictly better than σ_i^*, because in case of $u_i(dis) \leq u_i(no\ dis)$ they either do not change the voting outcome (if i is not pivotal) or changes it from $no\ dis$ to dis. Similarly, in case of $u_i(dis) > u_i(no\ dis)$ they either do not change the voting outcome (if i is not pivotal) or changes it from dis to $no\ dis$. Hence, σ_i^* is indeed undominated for all receivers i.

Is it the unique undominated one? To prove this it suffices to show that all possible pure strategies other than σ_i^* are (weakly) dominated. Note, that each alternative strategy σ_i must either (i) prescribe to vote N_i for some $(x_R, x_{M1}, x_{M2}, x_L)$ where $u_i(dis) > u_i(no\ dis)$ or (ii) prescribe to vote Y_i for some $(x_R, x_{M1}, x_{M2}, x_L)$ where $u_i(dis) \leq u_i(no\ dis)$ or (iii) both. Any strategy in category (i) does equally well as σ_i^* if $u_i(dis) \leq u_i(no\ dis)$ but worse for those $(x_R, x_{M1}, x_{M2}, x_L)$ with $u_i(dis) > u_i(no\ dis)$ and only one other receiver j voting Y_j. This implies that the same holds for strategies in category (iii). Any strategy in category (ii) does equally well as σ_i^* if $u_i(dis) > u_i(no\ dis)$ and worse for those $(x_R, x_{M1}, x_{M2}, x_L)$ with $u_i(dis) < u_i(no\ dis)$ and at least one other receiver j voting Y_j. Only in the degenerate case where $(x_R, x_{M1}, x_{M2}, x_L)$ is such that $u_i(dis) = u_i(no\ dis)$ strategies in category (ii) are not weakly dominated by σ_i^*. We, therefore, call the identified undominated NE only 'generically' unique. QED

We now show with the help of the above proposition that for standard preferences there exists a unique undominated SPNE of our game, where the representative keeps everything.

Proposition 2. Unique SPNE with standard preferences
Assume that all players only care about their own material well-being. There is a unique SPNE in undominated strategies where the representative offers $(x_R^*, x_{M1}^*, x_{M2}^*, x_L^*) = (200, 0, 0, 0)$ *and all receivers vote against disapproval for all proposals.*

Proof:

1. From Lemma 1 we know that in the undominated NE of the voting subgame receivers will vote in favor of disapproval only if they receive higher utility when disapproval takes place than if it does not take place. However, disapproval is costly, each receiver loses $k = 20$, and, hence, with standard preferences each receiver would be strictly worse off with than without disapproval, for any proposal. Hence, in the undominated equilibrium no receiver will ever vote in favor of disapproval.
2. Given the voting strategies of the receivers the unique best response of the representative is to propose $(x_R, x_{M1}, x_{M2}, x_L) = (200, 0, 0, 0)$.

QED

1.2 Undominated equilibria with social preferences

Now we assume that players are not only concerned with their own material payoff but also with their material payoffs relative to the other players. That implies that, in contrast to the standard preferences analysis, we now have to take into account that players differ in their initial endowment E_i. We define the total income of a player i by $X_i = E_i + x_i - y_i$, where $E_i, x_i,\ y_i$ stand for the initial endowment, received (or kept) share from (by) the representative, and potential disapproval costs, respectively.

Since players have different information about the proposed allocation in the private information (PI) and the common information (CI) treatment we treat these instances separately. First, we analyze the private information case followed by the common information case. Generally, we assume that the utility of a receiver potentially depends on her own income and the income of the other players: $u_i(X_i, X_j, X_k, X_l) = u_i(X_i, s(X_i, X_j, X_k, X_l))$ for $i, j, k, l = R, M1, M2, L;\ i \neq j \neq k \neq l$ where $s(X_i, X_j, X_k, X_l)$ can differ depending on the available information.

1.2.1 Private information about proposed allocation

When there is only private information about the proposed allocation each receiver learns her own share and, hence, her relative standing with respect to the other three players as a whole, but does not know her relative income regarding the individual other players. In such a situation, it is natural to assume that only the aggregate other income is taken into account when evaluating her utility. Therefore, for our analysis we adopt the utility function proposed by Fehr and Schmidt (1999) for a receiver, say $M1$, in the following way:

$$u_{M1}(X_R, X_{M1}, X_{M2}, X_L) = X_{M1} - \alpha \max\left\{\frac{X_R + X_{M2} + X_L}{3} - X_{M1}, 0\right\} - \beta \max\left\{X_{M1} - \frac{X_R + X_{M2} + X_L}{3}, 0\right\}$$

It is defined equivalently for receivers $M2$ and L.

We start with a couple of observations that follow directly from this definition:

- When there is no disapproval, for a middle-endowment receiver $M1$, it holds that she is (weakly) worse off than the others on average iff

$$\frac{1}{3}[(E_R + x_R + E_{M2} + x_{M2} + E_L + x_L) - 3(E_{M1} + x_{M1})] \geq 0$$
$$\Leftrightarrow \frac{1}{3}[200 - 4x_{M1}] \geq 0 \Leftrightarrow x_{M1} \leq 50.$$

  Equivalently for a middle-endowment receiver $M2$.

- When there is no disapproval, for a low-endowment receiver L, it holds that she is (weakly) worse off than the others on average iff

$$\frac{1}{3}[(E_R + x_R + E_{M1} + x_{M1} + E_{M2} + x_{M2}) - 3(E_L + x_L)] \geq 0$$
$$\Leftrightarrow \frac{1}{3}[400 - 4x_L] \geq 0 \Leftrightarrow x_L \leq 100.$$

- When there is disapproval, for a middle-endowment receiver $M1$, it holds that she is (weakly) worse off than the others on average iff

$$\frac{1}{3}[(E_R - K + x_R + E_{M2} - k + x_{M2} + E_L - k + x_L) - 3(E_{M1} - k + x_{M1})] \geq 0$$
$$\Leftrightarrow \frac{1}{3}[20 - 4x_{M1}] \geq 0 \Leftrightarrow x_{M1} \leq 5.$$

  Equivalently for a middle-endowment receiver $M2$.

- When there is disapproval, for a low-endowment receiver L, it holds that she is (weakly) worse off than the others on average iff

$$\frac{1}{3}[(E_R - K + x_R + E_{M1} - k + x_{M1} + E_{M2} - k + x_{M2}) - 3(E_L - k + x_L)] \geq 0$$
$$\Leftrightarrow \frac{1}{3}[220 - 4x_{M1}] \geq 0 \Leftrightarrow x_{M1} \leq 55.$$

- When there is no disapproval, for a middle-endowment receiver $M1$, it holds that she is better off than the others on average iff

$$\frac{1}{3}[3(E_{M1} + x_{M1}) - (E_R + x_R + E_{M2} + x_{M2} + E_L + x_L)] \geq 0$$
$$\Leftrightarrow \frac{1}{3}[4x_{M1} - 200] \geq 0 \Leftrightarrow x_{M1} \geq 50.$$

  Equivalently for a middle-endowment receiver $M2$.

- When there is no disapproval, for a low-endowment receiver L, it holds that she is (weakly) better off than the others on average iff

$$\frac{1}{3}[3(E_L + x_L) - (E_R + x_R + E_{M1} + x_{M1} + E_{M2} + x_{M2})] \geq 0$$
$$\Leftrightarrow \frac{1}{3}[4x_L - 400] \geq 0 \Leftrightarrow x_L \geq 100.$$

- When there is disapproval, for a middle-endowment receiver $M1$, it holds that she is (weakly) better off than the others on average iff

$$\frac{1}{3}[3(E_{M1} - k + x_{M1}) - (E_R - K + x_R + E_{M2} - k + x_{M2} + E_L - k + x_L)] \geq 0$$
$$\Leftrightarrow \frac{1}{3}[4x_{M1} - 20] \geq 0 \Leftrightarrow x_{M1} \geq 5.$$

  Equivalently for a middle-endowment receiver $M2$.

- When there is disapproval, for a low-endowment receiver L, it holds that she is (weakly) better off than the others on average iff

$$\frac{1}{3}[3(E_L - k + x_L) - (E_R - K + x_R + E_{M1} - k + x_{M1} + E_{M2} - k + x_{M2}) -] \geq 0$$
$$\Leftrightarrow \frac{1}{3}[4x_{M1} - 220] \geq 0 \Leftrightarrow x_{M1} \geq 55.$$

Next we derive the necessary conditions for receivers to vote against disapproval in case only one other receiver votes against disapproval. In such a situation the receiver would be pivotal and, hence, will vote against disapproval iff she is better off without than with disapproval.

We restrict the analysis to the interesting case where the proposal is such that $0 \leq x_{M1} \leq 50$ and $0 \leq x_{M2} \leq 50$ and $0 \leq x_L \leq 100$. This corresponds to the case where without disapproval each receiver is (weakly) worse off than the other players on average. Note, however, that this still allows for the full range of shares kept by the representative, i.e., $0 \leq x_R \leq 200$. Specifically, the representative can still keep nothing or allocate the resources such that all are equally off without disapproval.

Receivers $M1$ ($M2$): If disapproval takes place there are two possible cases:

- Case 1: Receiver $M1$ is worse off then the other players on average:

$$\frac{1}{3}[20 - 4x_{M1}] \geq 0 \Leftrightarrow x_{M1} \leq 5,$$

  then, receiver $M1$ prefers no disapproval over disapproval iff

$$x_{M1} - 20 - \alpha\frac{1}{3}[20 - 4x_{M1}] \leq x_{M1} - \alpha\frac{1}{3}[200 - 4x_{M1}]$$
$$\Leftrightarrow \alpha\frac{1}{3}180 \leq 20 \Leftrightarrow \alpha \leq \frac{1}{3}.$$

- Case 2: Receiver $M1$ is better off then the other players on average:

$$\frac{1}{3}[4x_{M1} - 20] \geq 0 \Leftrightarrow x_{M1} \geq 5,$$

  then, receiver $M1$ prefers no disapproval over disapproval iff

$$x_{M1} - 20 - \beta\frac{1}{3}[4x_{M1} - 20] \leq x_{M1} - \alpha\frac{1}{3}[200 - 4x_{M1}]$$
$$\Leftrightarrow \alpha\frac{1}{3}[200 - 4x_{M1}] + \beta\frac{1}{3}[20 - 4x_{M1}] \leq 20$$
$$\Leftrightarrow x_{M1} \geq \frac{50\alpha + 5\beta - 15}{\alpha + \beta}.$$

Receivers L: If disapproval takes place there are two possible cases:

- Case 1: Receiver L is worse off then the other players on average:

$$\frac{1}{3}[220 - 4x_L] \geq 0 \Leftrightarrow x_L \leq 55,$$

then receiver L prefers no disapproval over disapproval iff

$$x_L - 20 - \alpha\frac{1}{3}[220 - 4x_{M1}] \leq x_L - \alpha\frac{1}{3}[400 - 4x_L]$$
$$\Leftrightarrow \alpha\frac{1}{3}180 \leq 20 \Leftrightarrow \alpha \leq \frac{1}{3}.$$

- Case 2: Receiver L is better off then the other players on average:

$$\frac{1}{3}[4x_L - 220] \geq 0 \Leftrightarrow x_{M1} \geq 55,$$

then receiver L prefers disapproval over no disapproval iff

$$x_L - 20 - \beta\frac{1}{3}[4x_L - 220] \leq x_L - \alpha\frac{1}{3}[400 - 4x_L]$$
$$\Leftrightarrow \alpha\frac{1}{3}[400 - 4x_L] + \beta\frac{1}{3}[220 - 4x_L] \leq 20$$
$$\Leftrightarrow x_L \geq \frac{100\alpha + 55\beta - 15}{\alpha + \beta}$$

In summary we have shown the following result:

Lemma 2. Preference for (no) disapproval for private information
Assume $0 \leq x_{M1}, x_{M2} \leq 50$ *and* $0 \leq x_L \leq 100$. *Then the following holds:*

1. *A middle-endowment receiver* $M1, M2$ *prefers the no disapproval outcome over the disapproval outcome iff*
   (a) *if* $0 \leq x_{M1}, x_{M2} \leq 5$ *and* $\alpha \leq \frac{1}{3}$
   (b) *if* $5 \leq x_{M1}, x_{M2} \leq 50$ *and* $x_{M1}, x_{M2} \geq \frac{50\alpha+5\beta-15}{\alpha+\beta}$
2. *A low-endowment receiver* L *prefers the no disapproval outcome over the disapproval outcome iff*
   (a) *if* $0 \leq x_L \leq 55$ *and* $\alpha \leq \frac{1}{3}$
   (b) *if* $55 \leq x_L \leq 100$ *and* $x_L \geq \frac{100\alpha+55\beta-15}{\alpha+\beta}$

This lemma shows that for both types of receivers, first, for very low offered shares, $x_{M.} \leq 5$ ($x_L \leq 55$), only receivers with very weak disadvantageous inequity aversion, $\alpha \leq 1/3$, prefer no disapproval over disapproval (compare conditions (a) in the lemma). Hence, for very low offers it is likely that a randomly chosen receiver actually prefers disapproval. Second, for offered shares that are not that low, $x_{M.} > 5$ ($x_L > 55$), the threshold at which receivers start to prefer disapproval over no disapproval increases with their (dis)advantageous inequity aversion. Third, the area of proposals where a receiver prefers disapproval of the representative over no disapproval is much larger for low-endowment receivers than for middle-endowment receivers. For instance, for $\alpha = 1/3$ a middle-endowment receiver accepts an offered share $x_{M.} = 6$, whereas a low-endowment receiver rejects even as high as $x_L = 54$. For another example assume that $\beta = 0$ and $\alpha = 1$ holds and is the same for all receivers, then both middle-endowment receivers prefer not to disapprove if the representative offers $(x_R, x_{M1}, x_{M2}, x_L) = (120, 40, 40, 0)$, whereas the low-endowment receiver prefers to disapprove if the proposer offers $(x_R, x_{M1}, x_{M2}, x_d) = (120, 0, 0, 80)$.

The last example already indicates that an income maximizing proposer may do best by excluding the low-endowment responder.

Proposition 3. Undominated SPNE for private information
Suppose that the representative is narrowly selfish (or at least has no strong fairness concerns) and that (he believes that) α and β are the same for all receivers. Then there is a (generically) unique undominated SPNE in the following strategies:

$$\sigma_i^* = \begin{cases} N_i & \begin{array}{l} \text{if } 0 \leq x_i \leq 5 \text{ and } \alpha \leq \frac{1}{3} \text{ or} \\ \text{if } 5 \leq x_i \leq 50 \text{ and } x_i \geq \frac{50\alpha+5\beta-15}{\alpha+\beta} \end{array} \\ Y_i & \text{otherwise,} \end{cases}$$

for $i = M1, M2$,

$$\sigma_L^* = \begin{cases} N_L & \begin{array}{l} \text{if } 0 \leq x_L \leq 55 \text{ and } \alpha \leq \frac{1}{3} \text{ or} \\ \text{if } 55 \leq x_L \leq 100 \text{ and } x_L \geq \frac{100\alpha+55\beta-15}{\alpha+\beta} \end{array} \\ Y_L & \text{otherwise,} \end{cases}$$

and

$$\sigma_R^* = \begin{cases} (x_R, x_{M1}, x_{M2}, x_L) = (200, 0, 0, 0) & \text{if } \alpha \leq \frac{1}{3} \\ (x_R, x_{M1}, x_{M2}, x_L) = (200 - 2\frac{50\alpha+5\beta-15}{\alpha+\beta}, \frac{50\alpha+5\beta-15}{\alpha+\beta}, \frac{50\alpha+5\beta-15}{\alpha+\beta}, 0) & \text{if } \alpha > \frac{1}{3} \end{cases}$$

Proof: The proof for receivers $M1, M2, L$ follows from Lemma 2 and Proposition 1. If $\alpha \leq 1/3$ the receivers vote N_i in the voting subgame independent of the proposal. Hence, the representative's utility is maximized by keeping everything. If $\alpha > 1/3$ the smallest share for which a receiver votes against disapproval is given by $\frac{50\alpha+5\beta-15}{\alpha+\beta}$ for receiver $M1$ and $M2$ and $\frac{100\alpha+55\beta-15}{\alpha+\beta}$ for receiver L. Since, for the representative being not disapproved is always better than being disapproved, the majority rule and the fact that $\frac{100\alpha+55\beta-15}{\alpha+\beta} > \frac{50\alpha+5\beta-15}{\alpha+\beta}$ imply that the mentioned proposal is indeed (the unique) payoff maximizing proposal. QED

Note, that Proposition 3 assumes $x_{M1}, x_{M2} \leq 50$ and $x_L \leq 100$ because this is assumed for the derivation of receiver strategies. Note, however, that if a middle-(low-)endowment receiver receives a share higher than 50 (100) she is better off than the average of the others. This implies she will prefer disapproval only if she is strongly advantageous inequity averse and if she receives very high offers. A money maximizing (or not strongly advantageous inequity averse) representative will, therefore, offer exactly 50 (100) which will be accepted.

1.2.2 Common information about proposed allocation

When there is common information about the proposed allocation each receiver learns her own share, the shares proposed to the other receivers, and the share the representative keeps. Hence, each receiver knows her relative standing with respect to each other individual player. In such a situation, one can assume—along the lines of Fehr and Schmidt (1999) (FS)—that players take their relative standing to each other individual into account. Hence, in the following we assume that receivers can be characterized with FS-preferences, that is for a receiver $M1$:

$$\begin{aligned} u_{M1}(X_R, X_{M1}, X_{M2}, X_L) = X_{M1} &- \frac{1}{3}\alpha\{\max\{X_R - X_{M1}, 0\} + \max\{X_{M2} - X_{M1}, 0\} + \max\{X_L - X_{M1}, 0\}\} \\ &- \frac{1}{3}\beta\{\max\{X_{M1} - X_R, 0\} + \max\{X_{M1} - X_{M2}, 0\} + \max\{X_{M1} - X_L, 0\}\}. \end{aligned}$$

It is defined equivalently for receivers $M2$ and L.

We start with a couple of observations:

- When there is no disapproval a middle-endowment receiver $M1$ is (weakly) worse off than each of the other players iff

$$E_R + x_R - [E_{M1} + x_{M1}] \geq 0 \quad \Leftrightarrow \quad x_{M1} \leq x_R + 50$$
$$E_{M2} + x_{M2} - [E_{M1} + x_{M1}] \geq 0 \quad \Leftrightarrow \quad x_{M1} \leq x_{M2}$$
$$E_L + x_L - [E_{M1} + x_{M1}] \geq 0 \quad \Leftrightarrow \quad x_{M1} \leq x_L - 50.$$

  Equivalently for a middle-endowment receiver $M2$.

- When there is no disapproval a low-endowment receiver L is (weakly) worse off than each of the other players iff

$$E_R + x_R - [E_L + x_L] \geq 0 \quad \Leftrightarrow \quad x_L \leq x_R + 100$$
$$E_{M1} + x_{M1} - [E_L + x_L] \geq 0 \quad \Leftrightarrow \quad x_L \leq x_{M1} + 50$$
$$E_{M2} + x_{M2} - [E_L + x_L] \geq 0 \quad \Leftrightarrow \quad x_L \leq x_{M2} + 50.$$

- If the receivers are (weakly) better off the above inequalities just reverse.

- Note that with disapproval the relative standing between receivers does not change because $k = 20$ is subtracted from all receivers. What changes is the relative standing to the representative who loses $K = 200$ in case of disapproval. Hence, for income comparisons between receivers with disapproval the above inequalities hold. In comparison to the representative the inequalities change as follows.

- When there is disapproval a middle-endowment receiver L is (weakly) worse off than the representative iff

$$E_R + x_R - K - [E_{M1} + x_{M1} - k] \geq 0 \quad \Leftrightarrow \quad x_{M1} \leq x_R - 130$$

  Equivalently for a middle-endowment receiver $M2$.

- When there is disapproval a low-endowment receiver L is (weakly) worse off than the representative iff

$$E_R + x_R - K - [E_L + x_L - k] \geq 0 \quad \Leftrightarrow \quad x_{M1} \leq x_R - 80$$

In the following we derive the necessary conditions for receivers to vote against disapproval in case only one other receiver votes against disapproval. In such a situation the receiver would be pivotal and, hence, will vote against disapproval iff she is better off without than with disapproval.

We restrict the analysis to the interesting case where the proposal is such that $0 \leq x_{M1} \leq 50$ and $0 \leq x_{M2} \leq 50$ and $0 \leq x_L \leq 100$. Note, that this still allows that the representative keeps nothing and that he allocates the resources such that all are equally off without disapproval. In particular, this assumption does not restrict the share a representative keeps for himself (i.e., $0 \leq x_R \leq 200$). For simplicity and because it is empirically extremely rare we also ignore the case where the representative is worse off than the receiver already without disapproval.

Receivers $M1$: Since the relative standing to the other receivers does not change and, hence, these comparisons drop out when comparing income with and without disapproval it suffices to analyze two cases:

- Case 1: Receiver $M1$ is worse off than representative R without disapproval and is also worse off than representative R with disapproval. In such a case it holds that

$$x_{M1} \leq x_R - 130,$$

and receiver $M1$ prefers no disapproval over disapproval iff

$$\begin{aligned} E_{M1} + x_{M1} - \frac{1}{3}\alpha[E_R + x_R - [E_{M1} + x_{M1}]] \quad &\geq \quad E_{M1} + x_{M1} - k - \frac{1}{3}\alpha[E_R + x_R - K - [E_{M1} + x_{M1} - k]] \\ &\Leftrightarrow \alpha \leq \frac{3k}{K-k} = \frac{1}{3}. \end{aligned}$$

- Case 2: Receiver $M1$ is worse off than representative R without disapproval and is better off than representative R with disapproval. In such a case it holds that

$$x_{M1} \geq x_R - 130,$$

and receiver $M1$ prefers no disapproval over disapproval iff

$$\begin{aligned} E_{M1} + x_{M1} - \frac{1}{3}\alpha[E_R + x_R - [E_{M1} + x_{M1}]] \quad &\geq \quad E_{M1} + x_{M1} - k - \frac{1}{3}\beta[E_{M1} + x_{M1} - k - [E_R + x_R - K]] \\ &x_{M1} \geq\Leftrightarrow [x_R + 50] - \frac{180\beta + 60}{[\alpha + \beta]}. \end{aligned}$$

- Equivalently for receiver $M2$.

Receivers L: Since the relative standing to the other receivers does not change and, hence, these comparisons drop out when comparing income with and without disapproval it suffices to analyze two cases:

- Case 1: Receiver L is worse off than representative R without disapproval and is also worse off than representative R with disapproval. In such a case it holds that

$$x_L \leq x_R - 80,$$

and receiver L prefers no disapproval over disapproval iff

$$\begin{aligned} E_L + x_L - \frac{1}{3}\alpha[E_R + x_R - [E_L + x_L]] \quad &\geq \quad E_L + x_L - k - \frac{1}{3}\alpha[E_R + x_R - K - [E_L + x_L - k]] \\ &\Leftrightarrow \alpha \leq \frac{3k}{K-k} = \frac{1}{3}. \end{aligned}$$

- Case 2: Receiver L is worse off than representative R without disapproval and is better off than representative R with disapproval. In such a case it holds that

$$x_L \geq x_R - 80,$$

and receiver L prefers no disapproval over disapproval iff

$$\begin{aligned} E_L + x_L - \frac{1}{3}\alpha[E_R + x_R - [E_L + x_L]] \quad &\geq \quad E_L + x_L - k - \frac{1}{3}\beta[E_{M1} + x_{M1} - k - [E_R + x_R - K]] \\ &x_L \geq\Leftrightarrow [x_R + 100] - \frac{180\beta + 60}{[\alpha + \beta]}. \end{aligned}$$

In summary we have shown the following result.

Lemma 3. Preference for (no) disapproval for common information
Assume $0 \leq x_{M1}, x_{M2} \leq 50$ and $0 \leq x_L \leq 100$ and $x_R \geq x_{M1}, x_{M2}, x_L$. Then the following holds:

1. *A middle-endowment receiver $M1, M2$ prefers the no disapproval outcome over the disapproval outcome iff*
   (a) *if $0 \leq x_{M1}, x_{M2} \leq x_R - 130$ and $\alpha \leq \frac{1}{3}$*
   (b) *if $x_R - 130 \leq x_{M1}, x_{M2} \leq 50$ and $x_{M1}, x_{M2} \geq x_R + 50 - \frac{180\beta+60}{\alpha+\beta}$*
2. *A low-endowment receiver L prefers the no disapproval outcome over the disapproval outcome iff*
   (a) *if $0 \leq x_L \leq x_R - 80$ and $\alpha \leq \frac{1}{3}$*
   (b) *if $x_R - 80 \leq x_L \leq 100$ and $x_L \geq x_R + 100 - \frac{180\beta+60}{\alpha+\beta}$*

This lemma shows, first, that whether receivers prefer (no) disapproval does not only depend on their own shares but also on the share x_R the representative keeps. Second, the area of proposals where a receiver prefers disapproval of the representative over no disapproval is larger for low-endowment receivers than for middle-endowment receivers. For instance, for sufficiently high aversion against disadvantageous inequality, i.e. $\alpha > 1/3$, a low-endowment receiver prefers disapproval already when her share is smaller than $x_R - 80$, whereas middle-endowment receivers prefer no disapproval for proposed shares up to 50 units smaller than $x_R - 80$ (see conditions (a) in Lemma 3). Similarly, for any given offer where a low-endowment receiver prefers no disapproval at the margin there exist offers up to 50 units smaller where middle-endowment receivers prefer no disapproval (compare conditions (b) in Lemma 3).

Proposition 4. Undominated SPNE for common information
Suppose that the representative is narrowly selfish (or at least has no strong fairness concerns) and that (he believes that) α and β are the same for all receivers. Then there is a (generically) unique undominated SPNE in the following strategies:

$$\sigma_i^* = \begin{cases} N_i & \begin{array}{l} \text{if } 0 \leq x_i \leq x_R - 130 \text{ and } \alpha \leq \frac{1}{3} \text{ or} \\ \text{if } x_R - 130 \leq x_i \leq 50 \text{ and } x_i \geq x_R + 50 - \frac{180\beta+60}{\alpha+\beta} \end{array} \\ Y_i & \text{otherwise,} \end{cases}$$

for $i = M1, M2$,

$$\sigma_L^* = \begin{cases} N_L & \begin{array}{l} \text{if } 0 \leq x_L \leq x_R - 80 \text{ and } \alpha \leq \frac{1}{3} \text{ or} \\ \text{if } x_R - 80 \leq x_L \leq 100 \text{ and } x_L \geq x_R + 100 - \frac{180\beta+60}{\alpha+\beta} \end{array} \\ Y_L & \text{otherwise,} \end{cases}$$

and

$$\sigma_R^* = \begin{cases} (x_R, x_{M1}, x_{M2}, x_L) = (200, 0, 0, 0) & \text{if } \alpha \leq \frac{1}{3} \\ (x_R, x_{M1}, x_{M2}, x_L) = (\frac{100}{3} + \frac{120\beta+40}{\alpha+\beta}, \frac{250}{3} - \frac{60\beta+20}{\alpha+\beta}, \frac{250}{3} - \frac{60\beta+20}{\alpha+\beta}, 0) & \text{if } \alpha > \frac{1}{3} \end{cases}$$

Proof: The proof for receivers $M1, M2, L$ follows from Lemma 3 and Lemma 1. If $\alpha \leq 1/3$ the receivers vote N_i in the voting subgame independent of the proposal, especially for $x_{M1} = x_{M2} = x_L = 0$. Hence, representative utility is maximized by keeping everything. If $\alpha > 1/3$ the smallest share for which a receiver votes against disapproval is given by $x_R + 50 - \frac{180\beta+60}{\alpha+\beta}$ for receiver $M1$ and $M2$ and $x_R + 100 - \frac{180\beta+60}{\alpha+\beta}$ for receiver L. Since, for the representative being not disapproved is always better than being disapproved, the majority rule and the fact that $x_R + 100 - \frac{180\beta+60}{\alpha+\beta} > x_R + 50 - \frac{180\beta+60}{\alpha+\beta}$ implies that a representative maximizes income by proposing exactly $x_R + 50 - \frac{180\beta+60}{\alpha+\beta}$ to both receivers $M1, M2$ and zero to receiver

L. To calculate the exact proposal set $x_R = 200 - x_{M1} - x_{M2} - x_L = 200 - 2x_R - 100 + \frac{360\beta+120}{\alpha+\beta} \Leftrightarrow 3x_R = 100 + \frac{360\beta+120}{\alpha+\beta} \Leftrightarrow x_R = \frac{100}{3} + \frac{120\beta+40}{\alpha+\beta}$. The optimal x_{M1}, x_{M2} are found by substituting this optimal x_R in $x_R + 50 - \frac{180\beta+60}{\alpha+\beta}$. QED

Note, that, as for the private information case, Proposition 4 assumes $x_{M1}, x_{M2} \leq 50$ and $x_L \leq 100$ because this is assumed for the derivation of receiver strategies. Note, however, that even if a middle-(low-)endowment receiver receives a share higher than 50 (100) then it only matters if she has overall more or less than the representative (because disapproval does not change the relative position between receivers). Hence, if a receiver is still worse off, then the above reasoning leading to Proposition 4 applies and the derived results still hold. If a receiver is better off she will prefer disapproval only if she is strongly disadvantageous inequity averse and receives a very high share. A money maximizing (or not strongly advantageous inequity averse) representative will, therefore, offer exactly 50 (100) which will be accepted.

1.2.3 Comparing receiver behavior in private and common information

In Lemma 2 and 3 we have characterized the set of receiver shares where a receiver prefers no disapproval over disapproval (and vice versa) in the private and common information treatment, respectively. Here we compare these areas for given inequity parameters in order to make statements regarding the difference or equivalence of the likelihood to vote in favor of disapproval under the different information conditions regarding the representative's proposal. For convenience, and without loss of generality, we shall discuss the conditions (if any) where a middle-endowment receiver $M1$ may prefer no disapproval over disapproval in the private information treatment but prefers disapproval over no disapproval in the common information condition. Together with the other results derived this gives an indication when a receiver will vote against disapproval under private information but in favor of disapproval under common information.

For the private information treatment we have to distinguish between offers smaller than 5 and larger than 5 (see Lemma 2).

- Case 1: Assume $0 < \alpha \leq \frac{1}{3}$ and let $\tilde{x}_{M1}$ be such that $0 \leq \tilde{x}_{M1} \leq 5$. Hence, in private information receiver $M1$ prefers no disapproval (Lemma 2). To see what the receiver may prefer in common information we have to distinguish two cases.
  - Case (a): If $0 \leq \tilde{x}_{M1} \leq x_R - 130$ then the receiver will also prefer no disapproval, because of the assumption $\alpha \leq \frac{1}{3}$ (Lemma 3).
  - Case (b): If $x_R - 130 \leq \tilde{x}_{M1} \leq 50$ then the receiver will prefer disapproval if $\tilde{x}_{M1} < x_R + \frac{50\alpha-130\beta-60}{\alpha+\beta}$ (Lemma 3). It is sufficient to show that this holds for $\tilde{x}_{M1} = 5 < x_R + \frac{50\alpha-130\beta-60}{\alpha+\beta}$. The latter inequality is equivalent to $x_R > \frac{45\alpha-125\beta-60}{\alpha+\beta}$. Since, the r.h.s. is decreasing in β it suffices to show that it holds for $\beta = 0$, i.e., that $x_R > \frac{45\alpha-60}{\alpha}$. The latter inequality holds for any feasible x_R when $0 < \alpha \leq \frac{1}{3}$.

  Hence, for very low shares, $0 \leq \tilde{x}_{M1} \leq 5$, it holds that a weakly inequity averse middle-endowment receiver who prefers no disapproval over disapproval will either also do so in common information, or will prefer disapproval in common information.

- Case 2: Assume $\tilde{x}_{M1}$ is such that $5 \leq \tilde{x}_{M1} \leq 55$ and $\tilde{x}_{M1} \geq \frac{50\alpha+5\beta-15}{\alpha+\beta}$. Hence, in private information receiver $M1$ prefers no disapproval (Lemma 2). To see whether the receiver may prefer disapproval in common information we are checking if the following holds: $x_R - 130 \leq \tilde{x}_{M1} \leq 50$ and $\tilde{x}_{M1} < x_R + \frac{50\alpha-130\beta-60}{\alpha+\beta}$. Hence, we need to show under what conditions $x_R + \frac{50\alpha-130\beta-60}{\alpha+\beta} > \frac{50\alpha+5\beta-15}{\alpha+\beta}$ holds. The latter inequality is equivalent to $x_R > \frac{135\beta+45}{\alpha+\beta}$. Thus, for relatively large x_{M1} a receiver will prefer no disapproval under private information and disapproval under common information if the share the representative keeps is large enough.

We have shown the following proposition:

Proposition 5. Comparison of preference for (no) disapproval in private and common information
(1) If $0 \leq x_{M1} \leq 5$ *a middle-endowment receiver who prefers no disapproval to disapproval under private information will under common information (a) also prefer no disapproval to disapproval if* $0 \leq x_{M1} \leq x_R - 130$ *but (b) prefer disapproval to no disapproval when* $x_R - 130 \leq x_{M1} \leq 50$.
(2) If $5 \leq x_{M1} \leq 50$ *a middle-endowment receiver who prefers no disapproval to disapproval under private information will under common information prefer disapproval to no disapproval if* $x_R > \frac{135\beta+45}{\alpha+\beta}$.

To see how restrictive the condition on x_R in (2) is we calculated the expected α and β based on the reported calibrated parameter values in Fehr and Schmidt (1999). Their calibration amounts to an expected $E\alpha = 0.85$ and expected $E\beta = 0.255$. Inserting this into the restriction on x_R reported in the above proposition gives $x_R > 72$. Hence, for reasonable α, β, and $x_R > 72$ it is likely that a receiver who prefers no disapproval under private information may prefer disapproval under common information.

2 Experimental procedures and instructions

Several measures were taken to guarantee anonymity. To exclude the possibility that participants could make inferences about the group to which they belonged each session was organized with at least two groups. Moreover, participants were seated randomly in the computer lab with isolated cubicles. It was explained that computer numbers were used to recognize participants during the experiment and the data analysis afterwards, but could not be linked to the participants names. In addition, during the experiment no communication was allowed, mobile phones were switched off and no participants could leave the lab. If participants had a question, they were asked to raise their hand so that one of the experimenters could come and answer the question in private.

After reading the instructions, the participants had to go through some control questions. The experiment did not start before all participants had correctly answered these questions. At the end of the experiment, participants were asked to fill in a short questionnaire. After all had completed this questionnaire, they were paid out confidentially in cash.

Instructions In this experiment, you can earn money. In this experiment you can earn francs. The francs you earn will be converted to Euro according to the conversion rate 200 francs = 1 Euro and paid out to you privately and confidentially after the experiment.

During the whole experiment, you are not allowed to communicate with the other participants in any other way than described in these instructions.

Before the start:

You will be randomly assigned to a group of 4 participants. Group compositions do not change throughout the 10 rounds. The composition of your group is anonymous. Each group member receives randomly one of the letters A, B, C or D as 'ID. Each letter corresponds to the same person during all 10 rounds.

During the experiment: At the beginning of each round, you and all other members in your group receive a fixed amount of francs. This is called your endowment. This endowment is not the same for everyone but depends on the letter ID. In each round, member A receives 200 francs, members B and C receive 150 francs each, and member D receives 100 francs.

In each round, participant A will also receive 200 additional francs at his free disposal. Of these additional francs member A can keep as much as he wants for himself and give as much as he wants to each of the other three participants in the group.

After A has made his decision about the distribution of the additional 200 francs, each member B, C, and D will get to know her own received amount but not what the others received or what A kept. *[Remark: With common information this phrase was replaced by: "After A has made his decision, each member B, C, and D will get to know her own received amount, how much A kept, and the amounts received by the other two members."]* Thereafter, members B, C and D are asked to vote whether or not to deduct francs from A's income. In case a majority (that is, at least two out of the three) votes in favor of deduction, 200 francs are deducted from A's earnings. In this case, members B, C and D (also those who did not vote in favor of deduction!) have to bear costs of 20 francs each.

Voting is secret. This means that nobody will get to know anyone's voting decision. *[Remark: With public voting, this phrase was replaced by: "Voting is public. This means that everybody will get to know everyone's voting decision."]*

Before taking any decision in a specific round, you can review all information you received in all past rounds. Before taking any decision in a specific round, members B, C and D will be privately asked about their opinion about the amount they received. After taking their respective decision, all participants are asked to give likelihood estimates about the voting decisions of the other participants. The amount they earn with these estimates depends on the reported likelihood estimates and the actual voting decisions of the other members. For your interest, we show here the mathematical formula used to calculate these additional earnings for members B, C and D (The earnings calculated for member A are calculated in a similar way).

The reported percentages $P_i (i = 0, 1, 2)$ whereby P_i is the percentage that i number of receivers vote in favor of deducting francs from A's income. Calculate $p_i = P_i/100$ for all $i = 0, 1, 2$. If j receivers vote in favor of deducting francs from A's income (with $j = 0, 1, 2$), then the additional earnings are equal to:

$$3 + 6p_j - 3\left((p_0)^2 + (p_1)^2 + (p_2)^2\right).$$

Once again, it is not important that you exactly understand this formula. It is sufficient that you realize that your expected earnings are maximized if you indicate your true estimation of the likelihood.

3 Descriptive statistics

Table 1: Percentage of votes in favor of disapproval per round and treatment

Round	Private info Secret voting	Private info Public voting	Common info Secret voting	Common info Public voting	Total
1	29.2%	54.2%	52.4%	33.3%	41.9%
2	37.5%	29.2%	66.7%	37.5%	41.9%
3	45.8%	33.3%	42.9%	54.2%	44.1%
4	58.3%	50.0%	61.9%	41.7%	52.7%
5	62.5%	25.0%	57.1%	54.2%	49.5%
6	50.0%	33.3%	52.4%	45.8%	45.2%
7	50.0%	29.2%	42.9%	41.7%	40.9%
8	45.8%	33.3%	57.1%	29.2%	40.9%
9	54.2%	33.3%	52.4%	33.3%	43.0%
10	54.2%	33.3%	76.2%	50.0%	52.7%
Total	48.8%	35.4%	56.2%	42.1%	45.3%

Table 2: Percentage of votes in favor of disapproval per villager type and treatment

Round	Private info Secret voting	Private info Public voting	Common info Secret voting	Common info Public voting	Total
Middle endowment	46.3%	26.9%	55.7%	35.0%	40.5%
Low endowment	53.8%	52.5%	57.1%	56.3%	54.8%
Total	48.8%	35.4%	56.2%	42.1%	45.3%

Table 3: Average share given to each group member per round

Round	Share A	Share B	Share C	Share D
1	90.16 (47.02)	34.71 (21.68)	39.74 (19.00)	35.39 (25.36)
2	98.10 (49.80)	35.90 (21.60)	34.29 (23.41)	31.71 (25.62)
3	89.52 (44.60)	38.71 (21.68)	36.77 (23.50)	35.00 (26.10)
4	101.77 (61.22)	32.74 (27.14)	37.26 (26.41)	28.23 (28.19)
5	106.36 (59.88)	33.71 (28.37)	27.10 (24.82)	32.84 (28.07)
6	99.13 (56.14)	34.16 (24.32)	40.07 (25.46)	26.65 (28.71)
7	94.10 (62.31)	32.39 (26.85)	38.65 (26.42)	34.87 (26.68)
8	94.84 (62.20)	32.68 (29.05)	39.10 (26.01)	33.39 (27.92)
9	97.94 (58.90)	36.19 (25.75)	32.65 (26.63)	33.23 (26.80)
10	116.87 (66.95)	28.06 (27.04)	30.55 (28.13)	24.52 (30.56)
Total	98.88 (57.64)	33.93 (25.54)	35.62 (25.34)	31.58 (27.58)

Note: Standard deviations between parentheses.

4 Robustness regarding last round effect

Since all subjects knew when the last round would take place and last round effects could affect the overall results, we examine here to what extent this is the case. Model 1 in Table 4 is the same model as the model presented in Table 2 in the main text, but now also reports the coefficients of the round fixed effects. None of these coefficients is statistically significant. As we use the last round as reference category this indicates that voting behavior in all rounds before the final round is not different from voting behavior in the last round. Model 2 in Table 4 reports the results of the same model but without the last round included. Excluding the last round lowers the significance of the effect of the public voting condition (from 5% to 10%) and the effect of the common information condition (which is not significant any more at the 10%). Importantly, the size of the coefficients remains similar, which suggests that the weaker statistical significance is mainly due to the lower sample size. Table 5, which reports the effect of the villager's endowment on the likelihood of being excluded, shows that the results remain robust to dropping the last round data. Also the results of the analysis of the effect of disapproval on the likelihood of the exclude-all-strategy and state dependence of this strategy (Table 6) do not change after dropping the last round data. Table 7 shows the correlation coefficients with the last round excluded. A comparison with Table 6 in the main text shows that these coefficients and their respective significance levels are similar to those with all 10 rounds included.

Table 4: Determinants of Disapproval Voting Decisions

	Model 1		Model 2	
Received share	-0.010^{***}	(0.001)	-0.011^{***}	(0.001)
Middle-endowment villager (dummy)	-0.143^{***}	(0.051)	-0.125^{**}	(0.053)
Common information (dummy)	0.118^{*}	(0.064)	0.103	(0.065)
Public voting (dummy)	-0.129^{**}	(0.064)	-0.114^{*}	(0.064)
Period 1	−0.038	(0.077)	0.014	(0.096)
Period 2	−0.069	(0.062)	−0.020	(0.087)
Period 3	−0.006	(0.072)	0.046	(0.088)
Period 4	0.059	(0.074)	0.110^{*}	(0.060)
Period 5	0.001	(0.077)	0.051	(0.080)
Period 6	−0.029	(0.069)	0.021	(0.080)
Period 7	−0.069	(0.066)	−0.018	(0.072)
Period 8	−0.071	(0.080)	−0.021	(0.072)
Period 9	−0.051	(0.069)		
N	930		837	
Pseudo R-squared	0.2203		0.2241	
Wald χ^2	210.13		154.49	
Prob χ^2	0.0000		0.0000	
Predicted probability	0.4437		0.4336	

Note: Probit regression with round fixed effects. Marginal probabilities reported. Robust standard errors to correct for intra-group dependencies. Significance levels (two-sided): * = 10%, ** = 5%, *** = 1%.

Table 5: Likelihood of Excluded Villager

	Secret voting		Public voting	
	Marg. Prob.	S.E.	Marg. Prob.	S.E.
Low-endowment villager (dummy)	-0.066	0.251	0.389^{**}	0.150
N	114		162	
Pseudo R-squared	0.0034		0.1168	
Observed probability	0.3333		0.3333	

Note: Probit regression with round fixed effects. Robust standard errors to correct for intra-group dependencies. Only observations with the 'exclude-one'- strategy. Significance levels (two-sided): * = 10%, ** = 5%, *** = 1%.

Table 6: Likelihood of the Exclude-All-Strategy

	Coef.	S.E.
Disapproval in round t-1 (dummy)	2.352^{***}	0.518
Exclude-all strategy in round t-1 (dummy)	1.593^{*}	0.941
Disapproval with exclude-all strategy in round t-1 (dummy)	-1.651^{*}	0.963
Constant	-2.778^{***}	0.505
N	248	
Wald χ^2	24.09	
Prob χ^2	0.0001	

Note: Significance levels (two-sided): * = 10%, ** = 5%, *** = 1%. Random effects panel data model. Estimation of this dynamic panel model requires an assumption about the relationship between the observations in period 1 and the individual-specific time-invariant error component. As the start of the process coincides with the start of the observation period for each individual, the initial observations can be assumed exogenous so that a standard random effects probit model can be estimated ((Steward, 2006)).

Table 7: Correlation of Strategy Choice and Disapproval with Rounds

	Strategies				
Treatments	exclude-all	exclude-one	no-exclusion high-share	no-exclusion low-share	disapproval rate
PI / sec.vot.	0.747^{**}	-0.684^{**}	-0.404	0.647^{*}	0.481
PI / pub.vot.	-0.498	0.410	0.105	-0.044	-0.409
CI / sec.vot.	0.688^{**}	0.261	-0.510	0.201	-0.463
CI / pub.vot.	0.686^{**}	0.456	-0.806^{***}	0.499	0.102

Note: Spearman rank-order correlation coefficients; significance levels (two-sided): * = 10%, ** = 5%, *** = 1%.

Mann-Whitney tests: same as reported in the main text but without last round.

The Mann-Whitney (MW) test results comparing punishment frequencies across treatments are robust to excluding the last round data.

- Disapproval rates are significantly lower in the public voting and PI treatment than in the secret voting and CI treatment: MW $z = 2.231$; two-sided $p = .026$
- For all other pair-wise treatment comparisons, differences are not statistically significant (two-sided $p > .314$).
- When pooling the data of both conditions PI and CI, disapproval rates are significantly higher when voting is secret than when it is public: MW $z = 1.440$; one-sided $p = .075$
- When pooling the data of both voting conditions, disapproval rates are more frequent when the information on the distribution is common (CI) than when it is private (PI): MW $z = 1.300$; one-sided $p = .096$

The MW test results comparing strategy frequencies across treatments are also robust to excluding last round data.

- The exclude-one strategy is significantly more often used in the treatment with public voting and private information on the proposed distribution (PI) than in the treatment with secret voting and common information on the proposed distribution (CI) (MW $z = 1.879$; one-sided $p = .030$) or with public voting and CI (MW $z = 1.804$; one-sided $p = .036$).
- All other pair-wise treatment comparisons do not show statistically significant differences (one-sided $p > .112$).
- Pooling the data of both voting conditions shows that the exclude-one strategy is used significantly less often if there is CI than with PI: MW $z = 1.753$; one-sided $p = .040$.
- No such significant difference is found when pooling the data of PI and CI and comparing secret voting and public voting: MW $z = 1.068$; one-sided $p = .143$.
- The exclude-all strategy is significantly less often used when voting is public and PI than in the treatment with secret voting and CI: MW $z = 1.534$; one-sided $p = .063$.
- When pooling the data of PI and CI, the relative frequency of this strategy is significantly lower with public voting than with secret voting: MW $z = 1.668$; one-sided $p = .048$.
- No such significant difference is found when pooling the data of both voting conditions and comparing PI and CI: MW $z = 0.501$; one-sided $p = .308$.
- The other pair-wise treatment comparisons for this strategy do not show significant differences (two-sided $p > .132$).
- The relative frequencies of the no-exclusion-high-share-strategy and the no-exclusion-low-share-strategy do not show any significant difference when compared between treatments (two-sided $p > .255$ and two-sided $p > .186$).

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