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Property, Redistribution, and the Status Quo
A laboratory study

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Abstract. A large strand of research has documented *negative* behavioral responses to redistribution, like lower effort and wasteful avoidance activity. We report experimental evidence showing a *positive* effect of redistribution on economic efficiency via the self-enforcement of property rights, and identify which status groups benefit more and which less. We model an economy in which wealth is produced if players voluntarily comply with the – efficient but inequitable – prevailing social order. We vary exogenously whether redistribution is feasible, and how it is organized. We find that redistribution benefits all status groups as property disputes recede. It is most effective when transfers are not discretionary but instead imposed by some exogenous administration. In the absence of coercive means to enforce property rights, it is the higher status groups, not the lower status groups, who benefit from redistribution being compulsory rather than voluntary.

Keywords: Redistribution; Property; Status; Correlated Equilibrium; Battle of Sexes; Experiment

JEL codes: C72, C92, D74, H23, P48

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1 Introduction

How does redistribution affect a person's economic status? Conceiving redistribution simply as a means to channel wealth from the relatively rich to the relatively poor, the answer is pretty straightforward: it helps the poor, and hurts the rich. Yet the truth is likely to be more complex. A large strand of research in public and monetary economics describes negative behavioral responses to redistribution like lower labor supply, lower effort, and higher expenditures for tax professionals (for an overview of the vast theoretical and empirical literature, see Trabandt and Uhlig (2011), Saez et al. (2012), and Doerrenberg et al. (2017)). If the dead-weight loss is large, redistribution could potentially hurt both the rich and the poor. In contrast, substantially less attention has been devoted to the theoretical conjecture that redistribution might also have a positive effect on economic efficiency, by reducing conflict over property rights (Grossman 1994, 1995; Bös and Kolmar 2003; Dal Bó and Dal Bó 2011). In particular, to this day there is no empirical evidence for such an effect. The present paper aims to fill that gap. Using a novel experimental paradigm, we test how redistribution affects efficiency via the self-enforcement of property rights, and identify which status groups benefit more and which less. For the purpose of clarity, we distinguish between a person's *status* as the degree of innate privilege in the prevailing social order, and her *economic status* as her position in the distribution of income (Bowles and Gintis 2002).

More effective self-enforcement could free up resources otherwise tied to enforcing property rights by coercive means, for more productive use. Expenditures for deterrence and coercion (police, judiciary, prisons, fences and walls, private security, etc.) are inherently unproductive, and thus socially wasteful (Skaperdas 1992; Hirshleifer 1995). In fact, even in countries with expansive (and expensive) enforcement institutions, property rights are not perfectly secure. The US Department of Justice, for instance, reports for 2018 a property crime rate of 108 victimizations per 1000 households.[1]

Extracting causal evidence from historical or contemporary field data on this important question is extraordinarily difficult. Both redistribution, property rights, and law enforcement are endogenously determined through the political process. In today's market democracies, a person's economic status results from a mix of exogenous factors like inheritance and descent,[2] and endogenous factors

[1] According to the World Prison Brief of the University of London, the US has an incarceration rate of 655 per 100,000 inhabitants. For comparison, the UK has 148, Germany 77. See https://www.prisonstudies.org/highest-to-lowest/prison_population_rate?field_region_taxonomy_tid=All. The 108 victimizations include only non-violent property crimes like burglaries, residential trespassing, motor-vehicle thefts, and other thefts. In addition, many violent crimes are also property related. For 2018, the DOJ reports 2.1 instances of violent robbery and 18.4 assaults (excluding rape and sexual assault) per 1000 individuals age 12 or older. See http://www.bjs.gov/index.cfm?ty=pbdetail&iid=6686. Exploiting spatial and temporal variation of land titles in the Brazilian Amazon between 1997 and 2010, Fetzer and Marden (2017) document the effect of insecure property rights on land-related violence, attributing 280 murders directly to land disputes.

[2] Pre-birth factors like parents' wealth, education, and ethnicity have been shown to heavily influence a person's lifetime earnings in many Western democracies (Bowles and Gintis 2002; Kahlenberg 2010; Chetty et al. 2014; Adermon et al. 2018). Historically, purely exogenous attributes like descent, primogeniture, ethnicity, and gender have played a major role in defining status differences concerning the access to resources, e.g. a certain piece of land, the right to exercise

like effort and acquired skill. Moreover, economic status may come along with the power to coerce others and to bend the rules of society to one's advantage (Glaeser et al. 2003; Acemoglu et al. 2015).[3] To generate causal evidence, we therefore design a laboratory environment with (a) no coercive enforcement of property rights, (b) exogenous variation of redistribution, and (c) an exogenous status measure that is orthogonal to other individual characteristics like preferences, productivity, and coercive power.

In particular, we model an N-players society of strangers whose members regularly experience anonymous bilateral encounters with other members. Wealth is produced by avoiding disputes over property rights, for which players need to voluntarily agree on who *claims* property of a coveted resource, and who *concedes*. The resulting stage game is a *Battle-of-the-Sexes (BoS)*. An individual's status in society is determined by the *status quo*, reflecting some prevailing legal or social order: a pre-birth lottery ranks players from highest to lowest degree of privilege. Whenever two players meet, they mutually and unambiguously recognize who is of higher status (and thus supposed to claim the resource) and who is of lower status (and thus supposed to concede that right to the other player). The higher (lower) one's rank, the more often the action recommended by the status quo is to claim (concede).

We illustrate that, with standard preferences, the status quo functions as a correlation device (Aumann 1974, 1987), and enables frictionless, efficient coordination of otherwise conflicting claims. The correlated equilibrium has a *bourgeois* character (Bhaskar 2000; Gintis 2007) as players comply with the prevailing order and concede to whoever is higher on the ladder. Thus – in equilibrium – the pre-birth status order becomes a self-enforced convention for allocating individual property rights between all members of society; a person's pre-birth status determines her economic status.[4] But in the presence of behavioral types (Embrey et al. 2015), who deviate from the prescribed order, the convention is fragile. The lower a player's rank, the lower her incentives to stick to the order. Theoretically, redistribution stabilizes the bourgeois equilibrium by increasing players' tolerance against occasional deviators.[5]

In a series of experimental treatments, we test the effectiveness of different ways to organize redistribution, reflecting stylized transfer institutions with different degrees of centralization; societies

a certain profession, the right to vote, and other privileges or property rights (Elster 1992; Schotter and Sopher 2003; Moulin 2004).

[3] Such "capturing of the political system" (Acemoglu et al. 2015) could, for instance, occur via mobilization of non-state armed actors, or softer means like bribes, lobbying, and control of media outlets. Gradstein (2007) argues that the rich (and powerful) are more likely to support the emergence of growth-promoting institutions – democracy, rule of law – that protect individual property rights when initial inequality (and thus power asymmetry) is not too large.

[4] In this theoretical framework, property rights are thus not a constraint but an outcome. For a similar perspective on property rights, see Grossman and Kim (1995); Grossman (2001), and more recently Diermeier et al. (2017).

[5] From a bargaining perspective (Schelling 1956; Crawford 1982), the bourgeois equilibrium can be understood as a self-enforced social contract (Binmore 1998), in which the members of a society have reached a (tacit) agreement about the appropriate compensation for waving one's own claim, in exchange for conceding possession to whoever is higher on the status ladder. Transfers expand the contract zone, i.e. the set of possible agreements. Possession becomes property by mutual acceptance (Bös and Kolmar 2003).

that rely predominantly on alms, tipping, and charity, versus societies with highly centralized welfare states. Specifically, we vary (a) whether redistributive transfers are feasible or not, (b) whether transfers are paid directly to the beneficiary or indirectly, via a central redistribution pool, and (c) whether players have full discretion over the amount they transfer or those same transfers are exogenously imposed by some amorphous administration.

We find that (i) in the absence of redistribution institutions, the status quo translates into an inefficient, pronounced payoff hierarchy. The Gini coefficient is .30 and efficiency reaches only 47% of its potential as players' willingness to concede decreases with their rank on the status ladder. (ii) Voluntary redistribution (both direct and indirect) makes all ranks better off as property disputes recede. The Gini coefficient drops to .18 and efficiency increases to 67%. Groups with higher willingness to transfer and thus lower payoff asymmetry systematically achieve higher levels of efficiency. (iii) Whereas the effectiveness of voluntary transfers stagnates around 70%, property disputes continue to recede over time when transfers are exogenously imposed, reaching 85% efficiency in late rounds. (iv) Virtually all the added surplus of the exogenously imposed redistribution accrues to the upper half of the pre-birth status ladder. (v) By disabling strategic motives to withhold conceding while keeping the transfer volume constant, we identify a *strategic* reluctance to concede as a second obstacle to the self-enforcement of property rights, in addition to payoff asymmetry. Exogenously administered, compulsory redistribution removes that strategic element.

In sum, our paper documents the existence of a Pareto-improving effect of redistribution via the self-enforcement of property rights. We thus corroborate the conjectures of a small strand of theoretical contributions in political economy. Grossman (1994), for instance, models a society of landowners, who earn rents from their land holdings, and peasants, who choose between allocating time to wage employment (on the landlord's premises), self-employment (on their own land), and banditry. He shows that when the technology of banditry is sufficiently effective, redistribution by means of a land reform is the landowners' optimal response to the threat of violent appropriation by the peasants. Grossman (1995) applies a similar argument to identify the conditions under which a class of capitalists voluntarily agrees to redistribute income to the working class via a tax-financed wage subsidy. Acemoglu and Robinson (2000) interprets the extension of voting rights to wider segments of society during the nineteenth century as a strategic commitment to redistribution aimed at preventing a revolution. In Bös and Kolmar (2003), two individuals differ with respect to their initial land possessions, production technology, and appropriation technology. When the time horizon is infinite, a self-enforced, Pareto-improving agreement is possible in which the less productive individual waives his property claims in exchange for a compensatory transfer. More recently, Dal Bó and Dal Bó (2011) illustrate how policies that are distortionary under the assumption of perfectly secure property rights can be optimal in a second-best world (Lipsey and Lancaster 1956) of imperfect property rights, in which such policies "buy social peace".

While in the same spirit as those papers, our theoretical framework is more parsimonious, in the interest of keeping the experimental environment sufficiently tractable. First, rather than allowing discrete investments into productive and appropriative activities, our production function relies on a binary action space *(claim, concede)*. Wealth is produced whenever there are secure individual property rights, which occurs when exactly one player claims and the other concedes. Second, our players do not differ in terms of their (production or appropriation) skills but only with respect to their position on the pre-birth status ladder, which defines the relative frequency of being the focal (Schelling 1960) claimant throughout one's life.

From a more technical vantage point, we relate to the literature on coordination of conflicting interests. Similar to the present paper, Isoni et al. (2013) interpret successful coordination on the pure equilibria of a highly asymmetric BoS game as "property conventions". Crawford et al. (2008) show that the power of focality – so effective when players' interests are perfectly aligned (Mehta et al. 1994; Bardsley et al. 2009) – is considerably reduced as soon as payoffs are minimally asymmetric. When payoff asymmetry is very pronounced, i.e. when players differ strongly in their preference ranking over the set of equilibria, even explicit recommendations to play a specific equilibrium fail, leading to substantial efficiency losses (Anbarcı et al. 2018). The recommendations fail because they are largely not followed by the players asked to play their less preferred equilibrium. We show that self-enforced redistribution institutions can restore the power of focality.

Several laboratory experiments have documented that – in repeated 2-person BoS games with partner matching – people use shared common history to successfully coordinate on turn-taking equilibria (Rapoport et al. 1976; Sonsino and Sirota 2003; Arifovic and Ledyard 2018), even if it implies ignoring readily available, exogenous correlation devices (Duffy et al. 2017). In such turn-taking equilibria, the player who concedes the right of playing her preferred equilibrium to her counterpart, relies on (the expectation of) direct reciprocity to (rightfully) expect being compensated by her counterpart's conceding in the future. But as social groups become larger and players interact with varying counterparts, it becomes disproportionately more difficult to (a) construct a shared common history and (b) rely on direct reciprocity. The self-enforced redistribution institutions studied in this paper illustrate how the general idea of turn-taking, i.e. to reconcile efficiency and equality, extends to larger, more anonymous settings.

The growing experimental literature on redistribution has almost exclusively focused on the effects of redistribution when property rights are secure. Agranov and Palfrey (2015) show that when inequality stems from experimentally induced differences in labor productivity, there is an equity-efficiency tradeoff as higher redistribution leads to lower labor supply. Instead, we study a situation without property right enforcement, in which inequality stems from agents being differently privileged in the prevalent order (status quo). Baranski (2016) studies how redistribution affects individual investment decisions into a common project. He shows that adding a second stage where players redistribute the total value of common production via multilateral bargaining yields much higher levels of efficiency than the typical voluntary contributions mechanism (VCM), in which distribution is exogenously imposed. A notable exception is the game studied by Ryvkin and Semykina (2017) where citizens can choose to replace a democratic regime, in which property rights are secure and redistribution requires a majority vote, by an autocrat who promises full redistribution but who can potentially expropriate the citizens. They show that subjects are more likely to voluntarily switch from democracy to autocracy when inequality is high.

The experimental studies of Sausgruber and Tyran (2011), Esarey et al. (2012), and Durante et al. (2014) indicate that redistribution choices in the laboratory are largely in line with observational field data (Fong 2001; Alesina and Angeletos 2005; Alesina and Giuliano 2011). Recent work of Cohn et al. (2019) confirms the explanatory power of lab methods for understanding the redistributive preferences not only of the general population but also of the economic elite. They report that the richest 5% of the US population is less supportive of redistribution than the bottom 95% because a larger share of the top 5% regards unequal earnings as fair even when the inequality is caused purely by luck. Taking advantage of Swiss direct democracy, Epper et al. (2020) document that preferences elicited in the laboratory predict individuals' support for redistribution in several national plebiscites.

Section 2 introduces the theoretical framework, followed by the experimental design in Section 3. We present our experimental results in Section 4 and discuss our findings in Section 5.

2 Theoretical Framework

We conceptualize society as a group of N players, whose members regularly experience anonymous bilateral encounters with other members, in which they produce wealth by voluntarily agreeing on who *claims* property of a coveted resource, and who *concedes*. Players differ only with respect to their position on a pre-birth status ladder. We first explain the stage game and then the supergame, in the absence of redistribution opportunities. We characterize a *bourgeois* equilibrium in which lower ranks voluntarily concede to higher ranks, and examine the role of zero-sum transfers in sustaining that equilibrium in the presence of behavioral types.

2.1 Stage Game

Two members $i = 1, 2$ of society N meet and face the question who of the two should own a coveted resource. For each player i, the set of possible actions is $A_i = \{claim, concede\}$. We define $a = (a_1, a_2)$ as an action profile with a_1 being the action of player 1 (the row player) and a_2 being the action of player 2 (the column player). Each player prefers being the sole claimant $(claim, concede)$ to the other player being the sole claimant $(concede, claim)$ to having unproductive disagreement $(claim, claim)$ or

$(concede, concede)$. Figure 1 shows the normal form game G with payoffs $x_i \in \{0, l, h\}$ and $0 < l < h$.[6]

		player 2	
		claim	*concede*
player 1	*claim*	$0, 0$	h, l
	concede	l, h	$0, 0$

Figure 1: Stage Game

The two pure Nash equilibria of G are $e_1 = (claim, concede)$ and $e_2 = (concede, claim)$, where e_1 is the equilibrium more favorable to player 1, and e_2 to player 2.[7] The mixed equilibrium e_{mix} is constituted by playing the action *claim* with $P_{mix}(claim) = \frac{h}{h+l}$ and results in an expected payoff of $E_{mix} = \frac{hl}{h+l} < l$.[8] The mixed equilibrium is thus unsatisfactory, both from a social and from an individual perspective whereas the two pure equilibria pose a coordination problem in which each of the players will eye her preferred equilibrium.

Potentially, this situation could be resolved with the help of a correlation device (Aumann 1974, 1987). This could for instance be a recommendation of play derived from some prevailing legal or social order, i.e. the *status quo*. Whenever two players meet, they know who is supposed to claim, and who to concede. For instance, the prevailing order could stipulate who is supposed to claim a certain piece of land (the first-born son of the deceased former owner or the peasant who has worked that land for years). It could also stipulate who is supposed to claim medical treatment at a crowded hospital (the person with the more expensive health plan or the person with the more urgent medical condition).[9]

Definition 1. *$\phi = (M_1, M_2, \pi)$ is a direct correlation device, where M_i, $i = 1, 2$, is the finite set of messages $M_i = A_i$ for player i. There is a probability distribution over the set of possible message profiles $M = \{e_1, e_2\}$ with $Prob(e_1) = \pi$ and $Prob(e_2) = 1 - \pi$. The device selects a message profile $m \in M$ according to the probability distribution and privately sends m_i to player i.*

In the extended game G_ϕ, where players receive a message before they play G, the combination of an identical dyadic action space A_i for both players and a direct correlation device (Myerson 1994) with mutually exclusive messages leads to the full revelation of the other player's message given one's own private message. Thus, when a player receives one of the two possible messages (*claim* or

[6] In some situations, $(concede, concede)$ may be preferable to $(claim, claim)$. Increasing the payoff of $(concede, concede)$ to l instead of 0 does not affect the general structure of the game, see Appendix A.2.

[7] Note that in this conception of the BoS, players coordinate by choosing *different* actions.

[8] The probabilities of the different outcomes in the mixed equilibrium are: $P(claim, claim) = \frac{h^2}{(h+l)^2}$, $P(claim, concede) = \frac{hl}{(h+l)^2}$, $P(concede, claim) = \frac{hl}{(h+l)^2}$ and $P(concede, concede) = \frac{l^2}{(h+l)^2}$. Disagreement is defined as playing either $(claim, claim)$ or $(concede, concede)$. The probability of disagreement is thus $\frac{h^2+l^2}{(h+l)^2}$.

[9] Both the definition of the extended game and of the correlated equilibrium closely follow the notation of Duffy et al. (2017).

concede), she knows that her counterpart received the opposite message and, as a result, mutually following the device will always end up in one of the pure Nash equilibria.

Definition 2. *A bourgeois equilibrium is a pair* (ϕ, σ) *such that the pure strategies* $\sigma_i : A_i \rightarrow A_i$ *of the players are identity maps that constitute a Nash equilibrium of the extended game* G_ϕ.[10]

In this correlated equilibrium, players always comply with whatever is recommended in the status quo: $\sigma_i(a_i) = a_i$. Following Bhaskar (2000) and Gintis (2007), we refer to it as the *bourgeois equilibrium*.[11]

2.2 Supergame

The supergame consists of an indefinite series of random and anonymous two-person encounters within N. In every encounter G_ϕ is played. A pre-birth lottery determines a player's rank in society. The higher (lower) one's rank, the more often the action recommended by the status quo is to *claim* (*concede*). A player's rank can be understood as a bundle of pre-birth characteristics (gender, ethnicity, inherited wealth, parents' education, etc.) affecting the frequency of situations in which - in the prevailing social or legal order - an individual is supposed to get a coveted good, or to accept that somebody else gets it.

Definition 3. *Let* Θ *be an exogenous status hierarchy were* $\theta_i \in \{1, 2, ..., N\}$ *denotes the rank of player i in the society such that the lower the number the higher the rank, and no two players can have the exact same rank* $\theta_i \neq \theta_{-i}$. *The function* $\vartheta : \Theta \rightarrow \pi$ *induces a message-hierarchy.* ϑ *chooses the probability* π *of the direct correlation device* ϕ *such that a player's probability to receive her favorable message increases linearly with her rank, i.e.* $\vartheta(\theta_i) = \frac{N-\theta_i}{N-1}$.

The rank of a player is not *directly* payoff-relevant. But it becomes *indirectly* payoff relevant through (i) the correlation device favoring higher ranks and (ii) the common expectation of compliance with the status quo. The former is due to ϑ determining the probability π of the direct correlation device ϕ such that it sends the message $m_i = claim$ more often to player i, the higher i's rank. The latter, as we have shown above, is true in the bourgeois equilibrium. Thus – in equilibrium – the function ϑ manifests the hierarchical ordering of Θ into a hierarchy of expected payoffs E_{θ_i}:

$$E_{\theta_i} = h\pi + l(1-\pi) = \frac{h(N-\theta_i) + l(\theta_i - 1)}{N-1} \tag{1}$$

In the bourgeois equilibrium, the highest rank $\theta_i = 1$ earns $x_i = h$ and the lowest rank $\theta_i = N$ earns $x_i = l$. The other ranks' expected payoffs fall between these two extremes, strictly (and linearly) decreasing in the rank's number.

[10] A bourgeois equilibrium corresponds to a direct correlated equilibrium following (Aumann 1974, 1987).

[11] In an infinitely repeated, symmetric, 2-person BoS game, Bhaskar (2000) distinguishes between an *egalitarian* convention, in which players use successful (lucky) coordination in the initial period to tacitly agree on alternating between both stage-game equilibria in all subsequent periods, and a *bourgeois* convention, in which players tacitly agree on sticking with the initial stage-game equilibrium forever.

Hypothesis 1. *The exogenous status hierarchy translates into a payoff hierarchy.*

2.3 Deviations from the Bourgeois Equilibrium

Potentially, there are many reasons why players would not follow the recommendation. For instance, there could be strategic uncertainty about the counterparts' level of rationality.[12] Players may just disregard the device or refuse to follow the recommendation due to some non-standard preferences (DellaVigna 2009), for instance other-regardingness.[13] There could also be misunderstandings about the direct nature of the device, resulting in ambiguity about the interpretation of the message (Duffy et al. 2017). Moreover, beliefs could be strategically distorted (Di Tella et al. 2015). We subsume all of the above reasons into the potential existence of *behavioral types* (Embrey et al. 2015), who sometimes deviate from the bourgeois equilibrium, and define w^j as the probability with which player i expects her counterpart j to deviate in a given encounter.[14] In the spirit of trembling hand perfection (Selten 1975), we then compute tolerance thresholds $\overline{w}^j$ to determine the maximum deviation propensity that a player would tolerate before starting to deviate herself from the bourgeois equilibrium.

In the supergame, a player is willing to comply and receive E_{θ_i} in $(1 - w^j)$ of her encounters and zero otherwise as long as complying with the status quo is more profitable than ignoring the device and receiving E_{mix}.[15] The lower a player's rank θ_i, the less frequently (π) she is supposed to *claim* in the status quo, the less she has to lose from the collapse of the bourgeois equilibrium, the lower her tolerance threshold $\overline{w}^j_{\theta_i}$:

$$\overline{w}^j_{\theta_i} = \frac{E_{\theta_i} - E_{mix}}{E_{\theta_i}} = 1 - \frac{hl}{h+l}[\pi h + (1-\pi)l]^{-1} \tag{2}$$

The lowest-ranked player's ($\pi = 0$) threshold $\overline{w}^j_N = \frac{l}{h+l}$ turns out to be the *critical threshold* for the existence of the bourgeois equilibrium. If the lowest rank N decides that it pays more to disobey the status quo, it would trigger a chain reaction that reduces the tolerance thresholds of higher-ranked players likewise to $\overline{w}^j_N$, leading to the collapse of the bourgeois equilibrium. To see this, assume for a moment that the lowest-ranked player systematically disobeyed and always played *claim*. As a consequence, the second-lowest player $N-1$ would see her payoff from the only encounter in which she is higher ranked being reduced from h to 0 (if she continues playing *claim*) or

[12] For example Rosenthal (1989) assumes in his bounded-rationality approach that best replies need only be played with a larger probability than other strategies, but not necessarily with probability 1.

[13] Note that (i) aversion to advantageous inequality (triggered by earning h and the other player l) decreases the distance in utility space between monetary payoffs h and 0. (ii) Aversion to disadvantageous inequality (when earning l and the other player h) decreases the distance between l and 0. (iii) People dislike disadvantageous inequality more than advantageous inequality. As a result, for inequality averse players, the difference between h and l is even larger in utility space than in monetary payoff space. See for instance Fehr and Schmidt (1999) and Charness and Rabin (2002).

[14] Note that for the belief w^j it is immaterial whether a given individual deviates deterministically (refusing to ever play the bourgeois equilibrium) or probabilistically (randomizing over the action space). Rather, w^j captures the mean disposition to deviate in the population.

[15] $E(a_i = m_i) \geq E(P_{mix}(claim)) \Rightarrow w^j 0 + (1 - w^j)E_{\theta_i} \geq E_{mix}$. For a detailed analysis of deviations in the stage game, see Appendix A.1.

l (if she disobeys the device herself and plays *concede*). Her expected payoff would thus be reduced (at least) to E_N and her tolerance threshold would drop to:

$$\overline{w}^j_{N-1} = \frac{l}{h+l} = \overline{w}^j_N := \overline{w}^{crit} \tag{3}$$

Proposition 1. *If the common belief w^j about the mean disposition to disobey is below $\overline{w}^{crit} = \frac{l}{h+l}$, then there exists a bourgeois equilibrium, in which all players comply with the status quo.*

2.4 Redistribution

The peril of entering such ruinous dynamic could be mitigated by increasing $\overline{w}^{crit}$. In principle, a simple transfer institution could achieve this. Consider for instance the possibility of making a zero-sum transfer in the immediate aftermath of successful coordination in the stage game.

Definition 4. *$\mathcal{T}$ is a transfer stage in which players of G_ϕ with payoff $x_i = h$ can make direct transfers $\tau_i \in [0, h]$ to the other player of G_ϕ with payoff $x_j = l$ after successful coordination.*

A transfer τ in every encounter would flatten the hierarchy of tolerance thresholds against potential deviations in (2). High ranks' thresholds would go down by the same amount that low ranks' thresholds go up. As a result, the *critical* threshold would increase by $\frac{\tau}{h+l}$:

$$\overline{w}^{crit}_\tau = \frac{l+\tau}{(l+\tau)+(h-\tau)} = \frac{l+\tau}{h+l} \tag{4}$$

In order to persuade the lowest rank to obey the status quo, high ranks need to transfer $\tau_{min} \geq w^j(h+l) - l$. Common knowledge about the mean disposition to disobey w_j thus translates into common knowledge about τ_{min}. The higher w^j, the higher the transfer needed to stabilize the bourgeois equilibrium. If provided, transfers would broaden the set of possible final payoff distributions as shown in Figure 2. The diagonal line represents the expected payoff distribution in the bourgeois equilibrium with zero transfers. The horizontal line depicts be the most extreme form of payoff redistribution (*egalitarian optimum*).[16] The shaded area between these two lines is the set of possible bourgeois equilibria reachable with different levels of average transfers.[17] All ranks are better of in any bourgeois equilibrium than in the mixed equilibrium. The higher the rank, the larger the difference.

Hypothesis 2. *Transfers increase the incidence of the bourgeois equilibrium.*

[16] The highest reasonable transfer is $\tau_{max} = \frac{h-l}{2}$, which would result in all players having equal payoffs. Transfers beyond τ_{max} would create new inequality by reversing the rank hierarchy. τ_{max} allows to stabilize the bourgeois equilibrium when the mean disposition to disobey is $\overline{w}^{crit}_{max} = \frac{1}{2}$. If w^j were even larger than $\overline{w}^{crit}_{max}$, transfers would not be able to stabilize the equilibrium.

[17] Note that the set of possible bourgeois equilibria corresponds to the set of turn-taking equilibria that would be possible if players could effectively communicate.

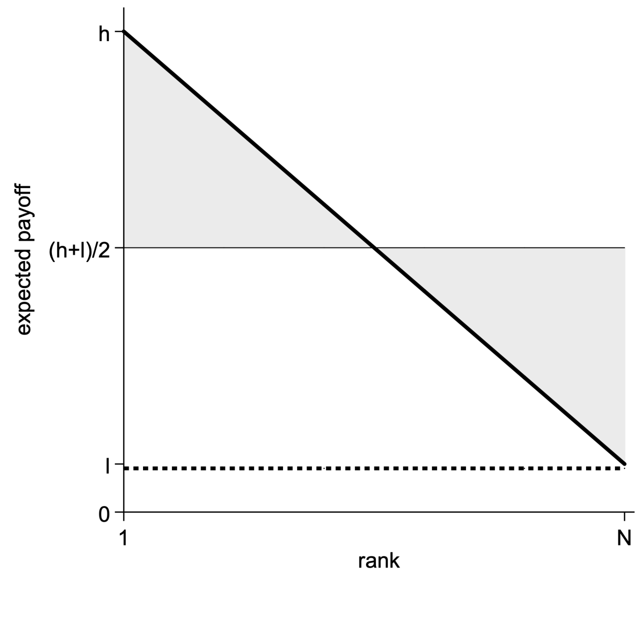

Figure 2: Equilibrium Payoffs by Rank
The thin horizontal line slightly below l denotes expected payoffs in the mixed equilibrium. The thin diagonal line shows expected payoffs in the bourgeois equilibrium without transfers, ranging from an expected payoff of h for rank 1 to an expected payoff of l for rank N. The shaded area up to the thick horizontal line at $\frac{h+l}{2}$ shows the bourgeois equilibrium with varying volume of transfers.

It can be easily shown that the voluntary provision of τ_{min} can be sustained in equilibrium. If all other players (are commonly expected to) provide exactly τ_{min}, no player has an incentive to unilaterally provide neither more nor less than τ_{min}. A *higher* transfer would entail additional cost without added benefit since τ_{min} is sufficient to secure perfect obedience of the lowest rank. On the other hand, a *lower* transfer would fail to reach the critical threshold, triggering the collapse of the bourgeois equilibrium. As shown above, all ranks are worse off in the mixed equilibrium. Thus, no player has a reason to deviate from τ_{min}.

Proposition 2. *If the common belief w^j about the mean disposition to disobey is below $\overline{w}^{crit} = \frac{1}{2}$, there exists a bourgeois equilibrium, in which the transfer τ_{min} is provided and all players comply with the status quo.*

3 Experimental Design

We conduct a laboratory experiment to test how redistribution affects efficiency via the self-enforcement of property rights, and to identify which status groups benefit more and which less. As laid out in the preceding section, our experimental environment describes an economy with zero coercive means to protect property claims. Status is being exogenously determined in a pre-game lottery, which defines a player's probability of receiving the recommendation to play *claim* or *concede* in a given period.

We compare a baseline treatment (*no-T*), in which redistributive transfers are not possible, to three treatments with an additional transfer stage. In treatment *T-direct* players can voluntarily make direct transfers to the person they just interacted with. In *T-pool* they can voluntarily transfer money to a central pool which is spread equally to all conceding subjects of that period. In *T-admin* players do not have discretion over their transfers. Instead, transfers are exogenously determined by a random draw from the empirical distribution of *T-direct*. The different transfer schemes reflect stylized transfer institutions differing in the degree of centralization; societies that rely predominantly on alms, tipping, and charity, versus societies with strongly centralized welfare states. In reality, these differences are generally not *ceteris paribus*. Rather, transfer institutions that vary in terms of centralization, tend to also differ in other aspects, most notably, their degree of coercion, and of administrative efficiency. We deliberately keep those aspects constant, and assume zero coercion, and zero efficiency losses.

The comparison between *T-direct* and *T-pool* indicates how agents' willingness to provide transfers reacts to diffusion of responsibility (Dana et al. 2007; Hamman et al. 2010; Bartling et al. 2014). Comparing *T-direct* and *T-admin* yields insights into the mechanism through which transfers affect a player's willingness to concede. If only distributional concerns mattered, we should see no difference between both treatments since transfer volumes are identical by design. Higher conceding in *T-admin* would reveal a strategic motivation (Schelling 1956; Crawford 1982) to withhold conceding as strategic considerations are pointless in *T-admin*. In contrast, higher conceding in *T-direct* would point at indirect reciprocity as the main effect channel since intentions cannot be transmitted without discretion (Charness and Rabin 2002; Falk et al. 2008). In the following, we explain the treatments in detail.

3.1 Treatments

no-T. The *no-T* treatment implements the game G_ϕ described in Section 2. Subjects are randomly assigned to groups of $N = 6$. The composition of the groups is constant over all periods. The paper instructions inform participants that, at the beginning of the experiment, each subject of a given matching group is randomly allocated a unique rank, labeled $\{a, b, c, d, e, f\}$ from highest to lowest. After the random draw, subjects are informed on their computer screens about their own rank. To mimic an infinite time horizon, we use a random continuation rule (Roth and Murnighan 1978), closely following the protocol of Camera and Casari (2009) and Bigoni et al. (2019). Subjects play 50 periods with certainty, thereafter the continuation probability decreases to $\delta = 0.75$. Hence, in every period $t > 50$, the expected number of additional periods is 3.

In every period, subjects are randomly paired within the group and play the 2-player BoS-game of Figure 1 with $h = 10$ and $l = 1$. With these parameters, the highest rank (i.e. the richest 17th percentile) earns 10 times more than the lowest rank (i.e. the poorest 17th percentile) in the bourgeois equilibrium before transfers. This hierarchy of expected payoffs approximates roughly the current income disparity in Germany, where the experiment was conducted. In Germany, the richest 17 percent of the population earn about 12 times more than the poorest 17 percent. For comparison, in the United States the richest 17 percent earn about 50 times more than the poorest 17 percent.[18]

The two actions *claim* and *concede* are labeled as *red* and *blue*, respectively. The correlation device is introduced through a salient highlighting of one of the two possible color-coded actions, i.e., the relatively higher-ranked (lower-ranked) player of each encounter sees the action *red* (*blue*) highlighted. This is commonly known to all subjects. Subjects are not explicitly informed about the absolute rank of their counterpart but can always infer the relative rank from the correlation device.

T-direct. The *T-direct* treatment is identical to *no-T* except that there is now an additional transfer stage (in every period), in which players can simultaneously make direct payoff, zero-sum transfers to each other. If a player earned $x_i = 10$ ($x_i = 1$) in G_ϕ, she can transfer up to 10 (1) tokens to the player who earned $x_i = 1$ ($x_i = 10$) in G_ϕ of the same encounter.[19]

T-pool. The *T-pool* treatment is identical to *no-T* except that there is now an additional transfer stage (in every period), in which players can simultaneously make payoff transfers to a fund that is spread evenly among all players. If a player earned $x_i = 10$ ($x_i = 1$) in G_ϕ, she can transfer up to 10 (1) tokens to pool P_L (P_H). Within each group, the sum of transfers to P_L (P_H) is then distributed equally among all players who earned $x_i = 1$ ($x_i = 10$) in that period.

T-admin. In the *T-admin* treatment, after-transfer payoffs are identical to *T-direct* except that players cannot choose themselves the amount transferred to their counterpart. Instead, players are informed that the computer will automatically determine a transfer amount. In particular, in each stage game of *T-admin*, the transfer amount τ_i is determined by a random draw from the empirical distribution of transfers in *T-direct*. For that purpose, all transfer decisions (including the decisions to transfer zero) from *T-direct* are put into one of 12 urns Υ_x^θ, depending on the rank $\theta \in \{a, b, c, d, e, f\}$ of the transferring player, and her stage-game payoffs $x \in \{1, 10\}$.[20] Whenever players in *T-admin* succesfully coordinate on $(claim, concede)$ or on $(concede, claim)$ and thus earn payoffs $(10, 1)$ or $(1, 10)$, the experimental software randomly draws (with replacement) a transfer amount from the respective urn. If for instance, b succesfully coordinated with c on $(claim, concede)$, the software would draw an amount τ_i from urn Υ_{10}^b to be transferred from b to c, and an amount τ_i from urn Υ_1^c

[18] Pre-tax income figures from the World Inequality Database: https://wid.world/.

[19] Note that, in addition to transfers from $x_i = 10$ to $x_i = 1$ players, our experimental design also allowed, in principle, transfers from $x_i = 1$ players to $x_i = 10$ players (see Appendix A.3). We chose not to preclude the latter in order to keep the transfer stage as normatively neutral as possible. Empirically however, those $x_i = 1$ to $x_i = 10$ transfers are negligible as they account for only $84/3417 = 2.5\%$ and $80/2471 = 3.2\%$ of all tokens transferred in *T-direct* and *T-pool*, respectively.

[20] When payoffs are zero, transfers are not possible.

to be transferred from c to b.[21] As a result, transfers in *T-admin* are virtually identical to transfers in *T-direct*.[22] See Figure A4.

3.2 Procedure

Every subject participated in exactly one supergame, which lasted between 50 and 60 periods. All periods played were payoff-relevant. Before the start of the experiment, paper instructions (see Appendix A.3) were handed out and read aloud to ensure common knowledge. Additionally, subjects had to pass extensive control questions to ensure full understanding. After the supergame, we elicited participants' (a) other-regarding preferences, (b) risk and trust attitudes as commonly elicited in the German Socioeconomic Panel (SOEP), (c) some socio-demographics (age, gender, number of siblings). See Appendix A.4.

The experiment was conducted at the BonnEconLab of the University of Bonn, Germany, and was computerized using the software z-Tree (Fischbacher 2007). From a database of more than 5000 people, we recruited 384 subjects (96 per treatment), using hroot (Bock et al. 2014). Each subject participated only in one treatment (between-subject design). Subjects were mainly undergraduate students from a variety of disciplines. Sessions lasted about 90 minutes and subjects earned on average 18.01 € (about 22.00 $) including a show-up fee of 4 €. During the experiment, payoffs where presented in experimental currency units (ECU), with a known exchange rate of ECU 25 = 1 €. Subjects sat in visually completely isolated cubicles.

4 Results

We first report how redistribution affects overall efficiency and the economic status of different ranks. Subsequently, we look into subjects' willingness to concede to higher-ranked players and their willingness to transfer money to lower-ranked players as the behavioral drivers.

4.1 Payoffs

Figure 3 shows the development of efficiency over time, in payoff units. While the *no-T* treatment generates substantially more wealth than the mixed equilibrium, it achieves only 47% of the payoffs attainable in the bourgeois equilibrium. With redistribution, efficiency improves to 67% in *T-direct* (p=.003) and 64% in *T-pool* (p=.016) but still falls significantly short of the bourgeois equilibrium prediction. In the first 15 periods, all three transfer treatments display a noticeable increase in

[21] Remember that the experimental design of *T-direct* also allowed transfers from $x_i = 1$ players to $x_i = 10$ players. Despite that case being empirically irrelevant (virtually all entries in Y_1^θ are zero), we account for it to keep the experimental instructions of *T-admin* and *T-direct* as similar as possible.

[22] We do not further differentiate the urns by period and/or by the rank of the transfer recipient since those two factors are empirically irrelevant (and have no implications for the wording of the instructions). Moreover, note that we do not inform participants of *T-admin* about the exact procedure that generates the transfers since that information could potentially convey a social norm.

efficiency whereas the *no-T* treatment does not. From period 15 on, payoffs in *T-direct* and *T-pool* stagnate at or below 70%. In contrast coordination in *T-admin* continues to rise throughout the duration of the supergame, averaging 85% in the last 10 periods, significantly higher than *T-direct* (p=.041) despite having – by construction – the same level of transfers.[23]

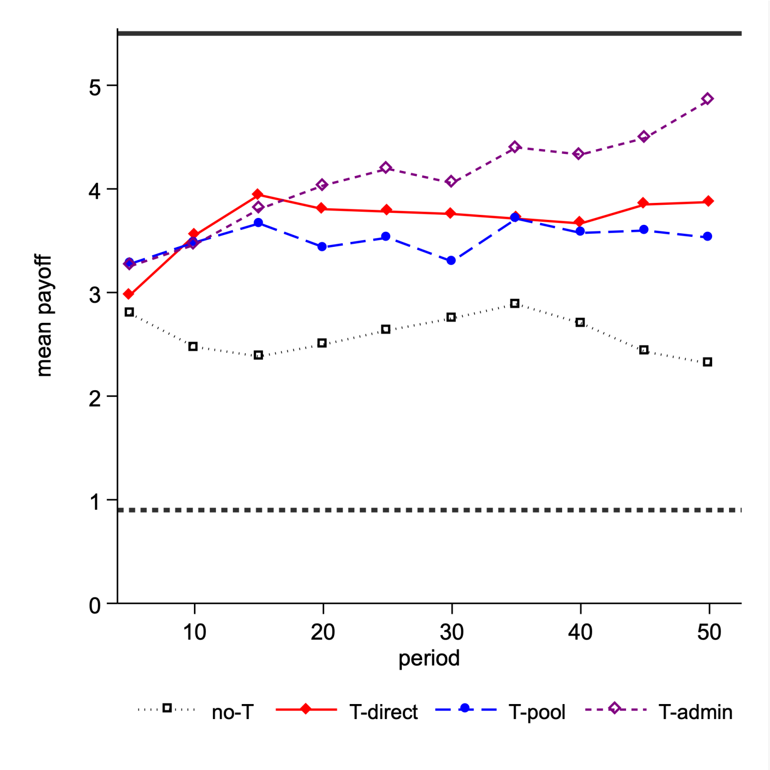

Figure 3: Payoffs over Time
Mean payoffs after transfers. The solid (dashed) horizontal line at 5.5 (.9) denotes predicted average payoffs in the bourgeois equilibrium (mixed equilibrium).

Figure 4 shows payoffs over time separately for for the lower ranks ($d - f$) and the upper ranks ($a - c$). Panel A of shows that for the lower half of the status hierarchy, the exact design of the transfer institution is immaterial. The large payoff difference concerns the presence of absence of some (any) transfer institution. In contrast, for the upper half the exact design matters a lot. Players who were given high status in the pre-play lottery benefit considerably from not having discretion about the amount to transfer. The difference between *T-admin* and *T-direct* begins to emerge around period 15 and continues to grow toward the end of the game. In the last 10 periods, upper ranks

[23] (i) For comparisons between treatments we report P-values of two-sided Mann-Whitney rank-sum tests over group means. There are 96 subjects per treatment and we use the first 50 periods for each individual. Per treatment, we thus have 4800 observations, clustered in 16 – statistically independent – groups per treatment. (ii) For comparisons of observed behavior with theoretical predictions, we report P-values of two-sided Wilcoxon signed-rank tests over group means. (iii) For comparisons between different ranks of the same treatment, we report P-values of two-sided Wilcoxon signed-rank tests of matched pairs. Decisions are first averaged over 50 periods, by individual. The means of rank i and rank j are then matched by group. For each comparison of any two ranks, there are thus 16 matched-pairs per treatment.

earn 26 percent more in *T-admin* than in *T-direct* (p=.026).[24]

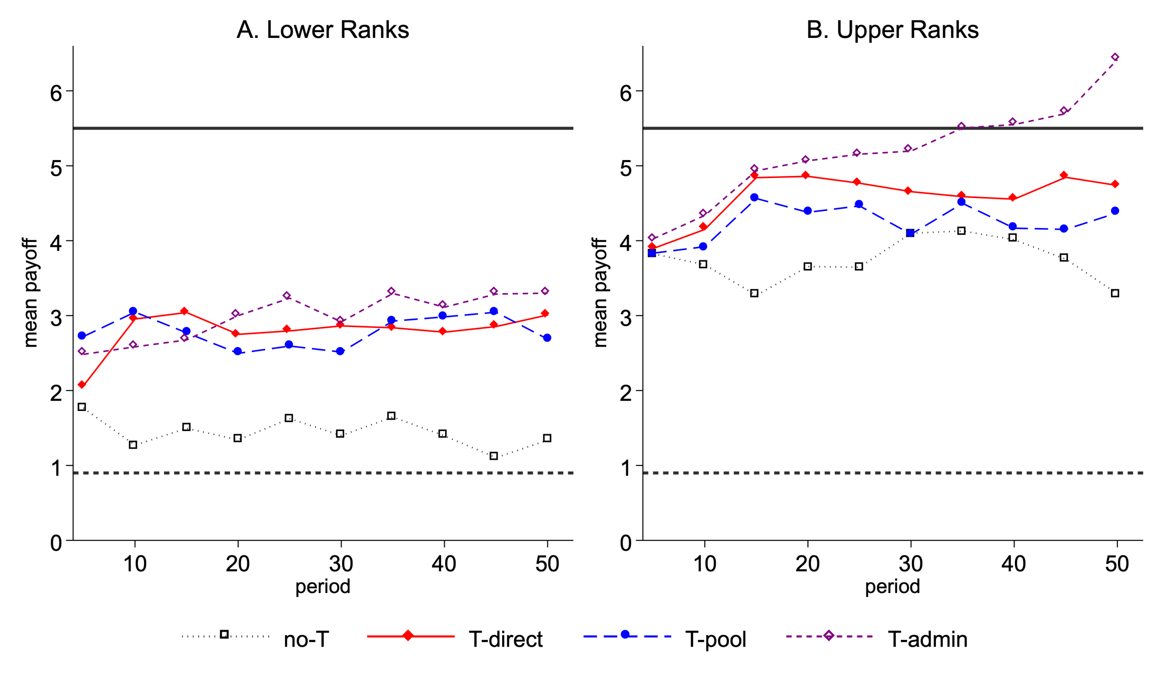

Figure 4: Payoffs over Time - Lower vs. Upper Ranks

Mean payoffs after transfers, for (A) ranks $d-f$, (B) ranks $a-c$. The solid (dashed) horizontal line at 5.5 (.9) denotes predicted average payoffs in the bourgeois equilibrium with maximum redistribution (mixed equilibrium).

In Figure 5 we disaggregate the treatment effects even further, to identify individual ranks and compare payoffs *before* and *after* transfers. The dashed black line at .9 shows the predicted payoffs in the mixed equilibrium: such a society would be poor but egalitarian. In contrast, the *no-T* treatment is significantly richer (p<.001) and displays a pronounced payoff hierarchy. The higher a player's rank, the higher her payoff.[25] Moreover, no rank is worse off than in the mixed equilibrium. Each rank $a-d$ earns significantly more than the mixed equilibrium (p<.049) payoff. The red and blue lines denote *T-direct* and *T-pool*, respectively. For each transfer treatment, we distinguish a thick line showing payoffs *before* transfers, and a thin line showing payoffs *after* transfers. Players are net contributors (net receivers) of transfers whenever the thin line is below (above) the thick line. In all transfer treatments the three upper ranks $a-c$ are net contributors and the three bottom ranks $d-f$ are net recipients of transfers.

There are four interesting observations. First, the availability of transfer institutions reduces the payoff hierarchy. The Gini coefficient drops from .30 in *no-T* to about .18 in the transfer treatments (p<.002). But even after transfers, the distribution of payoffs is far from flat but still conditioned by the draw of luck that determines a player's position on the status ladder. Second, lower ranks not

[24] Note that when averaging over *all ranks* (as in Figure 3), 5.5 is the highest possible mean payoff. *Subgroups* of ranks can achieve mean payoffs above 5.5 (as in Panel B of Figure 4).

[25] Averaged over all 50 periods, a earns substantially more than f (p<.001); among the directly adjacent ranks, a earns more than b (p=.020), b more than c (p=.017), c more than d (p=.038), d more than e (p=.002), e more than f (p=.083)

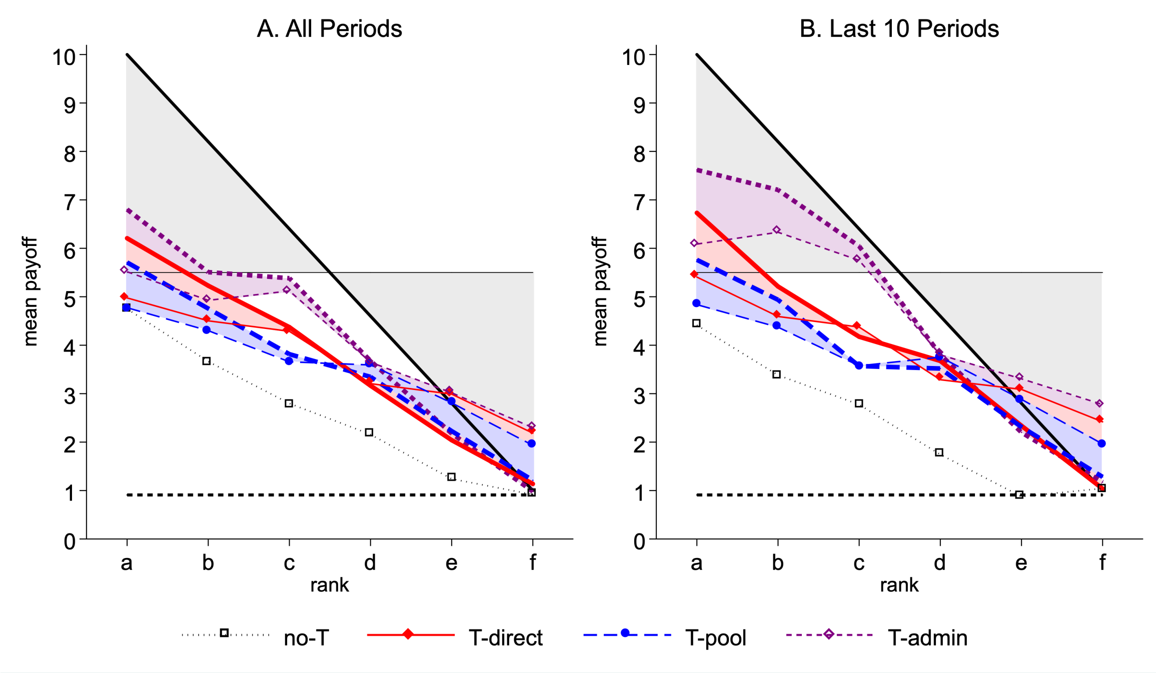

Figure 5: Effect of Redistribution on Payoff, by Ranks
Mean payoffs *before* (thick lines) and *after* (thin lines) transfers, averaged over (A) periods 1-50 or (B) periods 41-50. The grey shaded area denotes predicted payoffs in the bourgeois equilibrium, with varying volume of transfers. The dotted line at .9 denotes the mixed equilibrium.

only benefit *directly* from the institutional environment – through the net transfers received – but also *indirectly* – through the reduction of miscoordination. In fact, compared to the *no-T* treatment, in each of the transfer treatments net recipients d ($p<.006$) and e ($p<.023$) would already be significantly better off *before* transfers, i.e. solely through the reduction of disputes over claims. Rank f, however, is only better off *after* transfers ($p<.001$). Third, no rank (not even a) is better off without rather than with transfer institutions. Averaged over all periods, even net contributors b ($p<.055$) and c ($p<.003$) have substantially higher after-transfer payoffs in *T-direct* and *T-admin* than in the baseline. Fourth, no rank loses from transfers being exogenously imposed rather than voluntary. Zooming in on the last 10 periods, we see that the thin purple *T-admin* line is consistently above the thin red *T-direct* line. The main beneficiaries of that lack of discretion are in fact ranks b ($p=.013$) and c ($p=.032$).

4.2 Compliance with the Status Quo

In the bourgeois equilibrium, players are predicted to follow the correlation device and thus choose the action *claim* when the message is *claim*, and to *concede* when told to *concede*. Figure 6 shows the conditional probabilities for (A) claiming and (B) conceding in the different treatments. Across all treatments, and for all ranks, the propensity to claim when told to claim is around 90%, corroborating the findings of Anbarcı et al. (2018). In contrast, the willingness to concede when told to concede appears to substantially vary with rank. In *no-T*, the higher a player's rank, the higher her willingness to concede when told to do so, ranging from 63% for rank b to 34% for f (p=.023).[26] This is in line with the idea that a player is more willing to abide by a given order, the higher her expected benefits from the order's existence. Or put differently, a deviation from the bourgeois equilibrium is less likely, the higher a player's expected cost from the deviation.

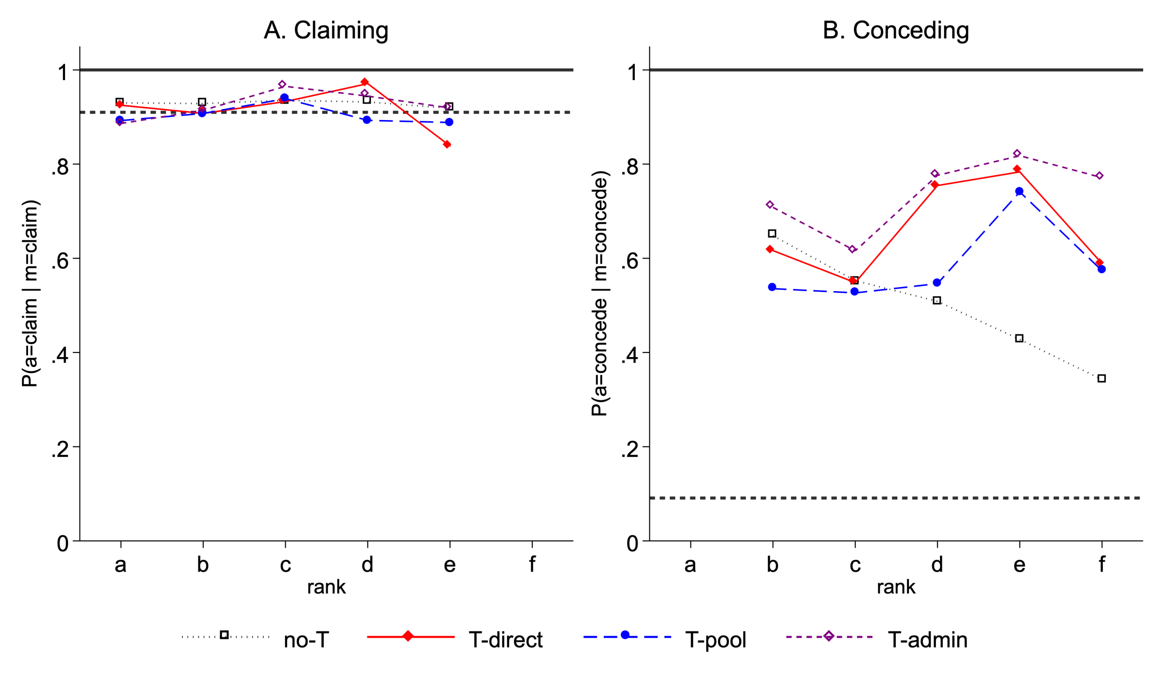

Figure 6: Compliance with the Status Quo

Mean relative frequency of complying with the exogenous recommendation when one's message is *claim* (A) or *concede* (B). The solid (dashed) horizontal line denotes predicted behavior in the bourgeois equilibrium (mixed equilibrium).

Yet interestingly, this logic does not seem to translate to the transfer treatments. In fact, we find the entire positive effect of transfer institutions on conceding to be driven by the bottom ranks. Compared to the *no-T* treatment, conceding of rank f increases by 24 percentage points in *T-direct* and *T-pool* (p<.033), respectively, and by additional 20 percentage points in *T-admin* (p=.067). For rank e the increase is 32-39 percentage points (p<.007). For rank d there is a significant rise in conceding of 25 percentage points in *T-direct* and *T-admin* (p<.008) but no effect in *T-pool*. In contrast, the willingness to concede of ranks b and c is virtually unaffected by the presence of redistribution.[27]

The difference between *T-admin* and *T-direct* reveals the importance of strategic motives for withholding conceding beyond purely distributional concerns, since - by design - transfers were virtually identical in both treatments (see Figure A4). Moreover, we find that, over time, a continuously

[26] For comparisons between different ranks of the same treatment, we report P-values of two-sided Wilcoxon signed-rank tests of matched pairs. Decisions are first averaged over 50 periods, by individual. The means of rank i and rank j are then matched by group. For each comparison of any two ranks, there are thus 16 matched-pairs per treatment.

[27] The treatment differences in players' willingness to concede become even more pronounced in late periods of the game. In the last 10 periods of the game, rank f's willingness to concede is 21 (p=.025) percentage points higher when transfers (with identical transfer volume, by design) are exogenously administered *T-admin* instead of freely chosen by their counterpart *T-direct* (see Figure A3).

growing number of players replaces the mixed strategy *sometimes concede* by the pure strategy *always concede* (see Figure A2) in *T-admin*. In contrast, the share of *always conceders* stagnates in *T-direct*. This pattern is consistent with the idea that, when transfers are discretionary, lower-ranked players show their teeth from time to time in the hope of pressuring higher ranks into more generous transfers.

4.3 Effect of Transfers

Mean transfers are significantly larger in *T-direct* than in *T-pool* (p=.046) as only 10% (9 of 87) of players give exactly zero throughout the entire game in *T-direct*, compared to 26% (23 of 89) in *T-pool* (p=.008).[28] The gap is driven by the willingness to transfer of the lower ranks. In particular, rank *d* (p=.002) and *e* (p=.044) transfer significantly more in *T-direct* than in *T-pool*. In fact, in *T-direct* the two lower ranks give significantly higher transfers (p=.038) than the three upper ranks.[29] Transfer behavior is very constant over time.

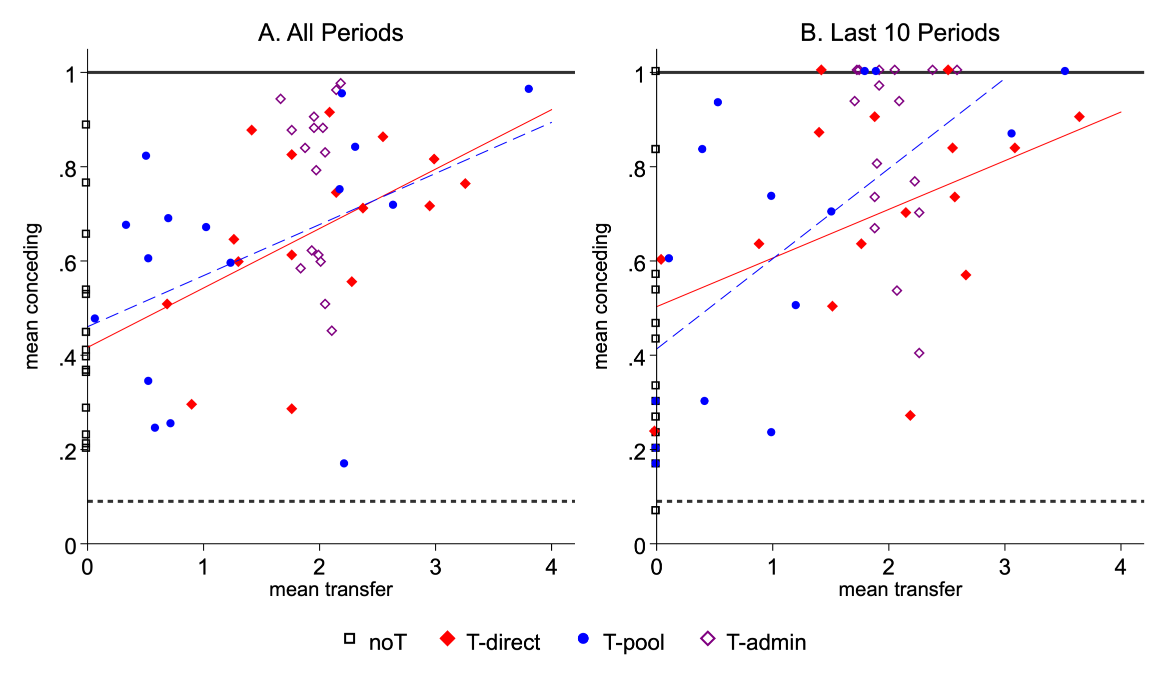

Figure 7: Transfers and Conceding, by Groups

Each dot depicts one group. There are 16 groups per treatment. Mean transfer given by the player earning $x_i = h$, and mean propensity of conceding when receiving the message *concede*, i.e. $P(a = concede|m = concede)$, averaged over all ranks. (A) For all 50 periods, and (B) for the last 10 periods of the game. The solid red (dashed blue) positive-slope line depicts the simple linear regression in *T-direct* (*T-pool*). The solid (dashed) black horizontal line denotes predicted behavior in the bourgeois equilibrium (mixed equilibrium).

In this game, transfers as such are *zero-sum* by design.[30] But indirectly they can contribute

[28] See Figure A4 and Figure A5 for more details. All transfer figures reported in this section describe mean transfers from $x_i = 10$ to $x_i = 1$ players (and not from $x_i = 1$ to $x_i = 10$ players), which account for $3333/3417 = 97.5\%$ and $2391/2471 = 96.8\%$ of all tokens transfered in *T-direct* and *T-pool*, respectively.

[29] Note that if transfer behavior were mainly driven by "last place aversion" (Kuziemko et al. 2014), we should in fact have observed the opposite: lower ranks in *T-direct* transferring (i) less than the upper ranks in *T-direct*, and (ii) less than the bottom ranks in *T-pool*.

[30] In contrast for instance to contributions in the extensively-studied public good game (Isaac et al. 1985), which are

to higher overall efficiency if they lead to more conceding, and thus higher rates of coordination. Panel A of Figure 7 shows that within each of the two endogenous transfer treatments *T-direct* and *T-pool*, groups with higher average transfers indeed tend to achieve a higher willingness to concede.[31] A simple OLS regression on this highly aggregated data reveals an intercept of .42 (p=.005) and a slope of .13 (p=.049) for *T-direct*, as well as an intercept of .46 (p<.001) and a slope of .11 (p=.071) for *T-pool*. A group with zero transfers is thus predicted to have a willingness to concede of about 44%, which happens to correspond exactly to the mean level of conceding observed in the *no-T* treatment (see Table A1). This suggests that the mere availability of transfer opportunities has no effect on coordination but rather whether and how transfers are used. As the average transfer volume in a group increases by 1 point, conceding increases by about 12 percentage points. The same pattern holds when looking at the last 10 periods only.[32] In fact, several groups manage to converge to perfect conceding as predicted in the bourgeois equilibrium, with rather diverse levels of transfers: one group in *no-T*, two in *T-direct*, three in *T-pool*, and six in *T-admin*. The stark difference between *T-direct* and *T-admin* underlines how much more effective redistribution is when administered exogenously. And yet, in all treatments, most groups fail to reach the bourgeois equilibrium, thus foregoing the chance at substantial (material) Pareto improvements.

While the observed positive correlation between transfers and conceding could support our theoretical conjecture that higher transfers lead to higher conceding, it could also reflect two other causal relationships: (i) higher conceding is rewarded by higher transfers, and (ii) the same individual traits determine both a player's willingness to transfers and her willingness to concede. To shed some additional light on the underlying mechanism, we take advantage of the panel structure of our experimental data, and of the fact that both players' ranks as well as the matching of players into groups and encounters were determined exogenously. In particular, we regress the mean propensity of conceding by a *lower* rank ($d-f$) in the *last 10 periods* on the mean transfer given by the *upper* ranks ($a-c$) of her respective group in the *first period* of the game. For the dependent variable, we look at the last 10 periods because that gives the lower ranks time to learn the general transfer willingness of the upper ranks in their group. For the explanatory variable, we use the first period because it is the only period in which transfers are uninfluenced by group dynamics. Consequently, *upper* ranks' mean transfer in period 1 can be interpreted as a home-grown disposition. Column 1 of Table 1 shows that, towards the end of the game, the willingness to concede of lower-rank player i in group k is 10 percentage points higher when she happened to share a group with upper-rank players

positive-sum by design.

[31] Since, by design, all groups in *T-admin* drew transfers from the exact same distribution, in Figure 7 there is virtually no variance of transfers between groups. And yet, there is substantial variance in the mean willingness to concede, ranging from about .4 to 1. This heterogeneity shows that even holding transfers constant, there are sizeable idiosyncratic differences between (groups of) individuals.

[32] Intercept of .50 (p=.001) and slope of .10 (p=.081) for *T-direct*, and intercept of .41 (p=.001) and slope of .19 (p=.007) for *T-pool*.

whose mean disposition to transfer was 1 token higher. Column 2 shows that the effect still holds - albeit weaker - when controlling for i's attitudes and socio-demographics.

Table 1: Effect of Transfers on Conceding

	(1)	(2)
	$Conceding_i^{lower\ rank}$ (in last 10 periods)	$Conceding_i^{lower\ rank}$ (in last 10 periods)
$Mean\ Transfer_k^{upper\ ranks}$(in period 1)	0.101^{***}	0.070^{*}
	(0.030)	(0.035)
$Mean\ Transfer_k^{upper\ ranks}$(in period 1) $\times$ *T-pool*	-0.008	0.006
	(0.056)	(0.057)
T-pool	-0.119	-0.179
	(0.170)	(0.173)
$SVOrientation_i$		0.011
		(0.053)
$Trust_i$		0.108
		(0.163)
$Risk_i$		-0.012
		(0.089)
Age_i		-0.015^{**}
		(0.007)
$Female_i$		0.183^{*}
		(0.100)
$Siblings_i$		0.068
		(0.050)
Constant	0.561^{***}	0.564^{***}
	(0.097)	(0.117)
Observations i	90	90
Clusters k	30	30
R^2	0.124	0.225

Ordinary Least Squares regression. The Dependent Variable $Conceding_i^{lower\ rank}$ denotes the mean willingness to concede of a lower-rank player i of group k in the last 10 periods of the game. The explanatory variable $Mean\ Transfer_k^{upper\ ranks}$ denotes the mean transfer given by the upper-rank players of group k in period 1. Ranks $a - c$ ($d - f$) are defined as upper (lower) ranks. The reference treatment is *T-direct*. Cluster-robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5 Conclusion

This paper provides first empirical evidence for the conjecture that redistribution can have a positive effect on economic efficiency by reducing disputes over individual property rights. We thus complement a large strand of research that has identified negative behavioral responses to redistribution, like lower effort and wasteful expenditures for avoidance. That literature typically assumes that property rights are being enforced, and focuses on individual differences in productivity and effort as drivers of inequality (Agranov and Palfrey 2015). In contrast, we assume zero coercion, and view (the absence of conflict over) property rights as the outcome of some implicit negotiation process between individuals who differ only in terms of their pre-birth privilege in the prevailing social order (status quo). To draw a more realistic picture of the net effect of redistribution on economic efficiency, further research should aim at systematically combining both stylized perspectives. A comprehensive assessment of the merits of redistribution needs to consider its implications on expenditures for law enforcement and private protection (Anderson 1999; Merlo 2003) as well as for conspicuous consumption (Hopkins and Kornienko 2004, 2009).

In our experiment, redistribution not only increases overall efficiency but improves the economic status of each rank on the pre-birth status ladder. While lower ranks benefit equally from each of the three stylized transfer institutions studied, upper ranks benefit most from the setting in which the transfer decision is taken out of their hands. Typically, compulsory redistribution is justified as a means to limit temptations to free-ride on other people's charitableness, potentially resulting in under-provision of redistributive funds. Our findings suggest an additional rationale: By removing strategic considerations to withhold conceding, exogenously imposed transfers are particularly effective at persuading recipients to obey the rules of the status quo, even if they are at the tail end of the prevailing social order. As a result, the main beneficiaries of exogenously administered transfers happen to be the upper ranks, who lose discretion but gain more secure claims to property. In the absence of coercive means, redistribution serves as a tool to turn privilege into economic payoff by enhancing the power of focality.

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A Appendix

A.1 Deviations in the Stage Game

In a given encounter, how would the belief that j may deviate affect i's willingness to obey the device? Depending on whether i received the message to (a) *claim* or to (b) *concede*, we distinguish two cases: (a) If $(m_i, m_j) = (claim, concede)$, the bourgeois equilibrium calls for $a_i = claim$. In expectations, i prefers to claim as long as j's deviation propensity w^j does not exceed $\overline{w}^j_{claim} = \frac{h}{h+l}$.[33] A player will thus claim her preferred action as long as $(1 - w^j)h$ gives her more utility than $w^j l$. In order to refrain from claiming, a player would need a very high belief w^j about her counterpart's deviation proneness. (b) If $(m_i, m_j) = (concede, claim)$, the bourgeois equilibrium calls for $a_i = concede$. In expectations, i prefers to concede as long as w^j does not exceed $\overline{w}^j_{concede} = \frac{l}{h+l}$.[34] With $0 < l < h$ already a small belief about j's deviation probability could result in i's not conceding. The threshold is the smaller, the larger the difference between l and h.[35]

A.2 Alternative Payoffs for Mutual Conceding

Consider an alternative stage game, where $(concede, concede)$ yields a mutual payoff of l (instead of a payoff of 0 as in G):

		player 2	
		claim	*concede*
player 1	*claim*	$0, 0$	h, l
	concede	l, h	l, l

Figure A1: Stage Game

As in G, there are two pure Nash equilibria $e_1 = (claim, concede)$ and $e_2 = (concede, claim)$. The mixed equilibrium e_{mix} is constituted by playing the action *claim* with $P_{mix}(claim) = \frac{h-l}{h}$ and results in an expected payoff of $E_{mix} = l$, which equals the lower payoff in the pure Nash equilibria.[36]

---

[33] $E(a_i = m_i | m_i = claim) \geq E(a_i \neq m_i | m_i = claim) \Rightarrow w^j 0 + (1 - w^j)h \geq w^j l + (1 - w^j)0$. For the parameters of the experiment, $h = 10$ and $l = 1$, a player would only refrain from claiming if she believed her counterpart's deviation probability to be larger than $\overline{w}^j_{claim} = \frac{10}{11}$. Note that an inequality averse player would perceive the difference between earning monetary payoff h and l even more starkly, and would thus need an even *higher* belief w^j to refrain from claiming.

[34] $E(a_i = m_i | m_i = concede) \geq E(a_i \neq m_i | m_i = concede) \Rightarrow w^j 0 + (1 - w^j)l \geq w^j h + (1 - w^j)0$. For the parameters of the experiment, $h = 10$ and $l = 1$, a player would refrain from conceding if she believed her counterpart's deviation probability to be larger than $\overline{w}^j_{concede} = \frac{1}{11}$. Note that an inequality averse player would perceive the difference between l and h more pronouncedly and thus would need an even *lower* belief w^j to refrain from conceding.

[35] Note that the tolerance thresholds $\overline{w}^j_{claim}$ and $\overline{w}^j_{concede}$ coincide with the mixing probabilities in the mixed equilibrium of G_ϕ. When a player chooses $a_i = claim$ with $P(claim) = \frac{h}{h+l}$ this is exactly the threshold where the counterpart is indifferent between both actions *claim* and *concede*. Until this threshold, the player who gets favored by the device always wants to follow the recommendation.

[36] The probabilities of the different outcomes in the mixed equilibrium are: $P(claim, claim) = \frac{(h-l)^2}{h^2}$, $P(claim, concede) =$

If $(m_i, m_j) = (claim, concede)$, the bourgeois equilibrium calls for $a_i = claim$. In expectations, i prefers to claim as long as j's deviation propensity w^j does not exceed $\overline{w}^j_{claim} = \frac{h-l}{h}$.[37] For the parameters of the experiment, $h = 10$ and $l = 1$, a player would only refrain from claiming if she believed her counterpart's deviation probability to be larger than $\overline{w}^j_{claim} = \frac{9}{10}$ (instead of $\frac{10}{11}$ in G).

If $(m_i, m_j) = (concede, claim)$, the bourgeois equilibrium calls for $a_i = concede$. In expectations, i prefers to concede as long as w^j does not exceed $\overline{w}^j_{concede} = \frac{l}{h}$. [38] For the parameters of the experiment, $h = 10$ and $l = 1$, a player would refrain from conceding if she believed her counterpart's deviation probability to be larger than $\overline{w}^j_{concede} = \frac{1}{10}$ (instead of $\frac{1}{11}$ in G).

In sum, the thresholds are very similar to G and with $0 < l < h$ already a small belief about j's deviation probability could result in i's refusal to concede. In the supergame, while E_{θ_i} is not affected by the parameter change, $E_{mix} = l$ is slightly higher than in G and equals the expected payoff of rank N in the bourgeois equilibrium.

$\frac{hl-l^2}{h^2}$, $P(concede, claim) = \frac{hl-l^2}{h^2}$ and $P(concede, concede) = \frac{l^2}{h^2}$.

[37] $E(a_i = m_i | m_i = claim) \geq E(a_i \neq m_i | m_i = claim) \Rightarrow w^j 0 + (1 - w^j)h \geq w^j l + (1 - w^j)l$.

[38] $E(a_i = m_i | m_i = concede) \geq E(a_i \neq m_i | m_i = concede) \Rightarrow w^j l + (1 - w^j)l \geq w^j h + (1 - w^j)0$.

A.3 Instructions

*Note: The text below shows the instructons of the **no-T** treatment, on which all other treatments build. The additional text in red was only included in instructions for the **T-direct** treatment. The additional text in blue was only included in instructions for the **T-pool** treatment. The additional text in purple was only included in instructions for the **T-admin** treatment. Instructions displayed here are a translation into English.*[39] *Original instructions where in German and are available from the authors upon request.*

Welcome to our experiment!

If you read the following instructions carefully, you can earn a substantial sum of money, depending on your decisions. It is therefore very important that you read these instructions carefully.

Absolutely no communication with the other participants is allowed during the experiment. Anyone disobeying this rule will be excluded from the experiment and all payments. Should you have any questions, please raise your hand. We will then come to you.

During the experiment, we will speak not of Euros, but of points. Your entire income will therefore initially be calculated in points. The total number of points accumulated by you during the experiment will be paid out to you in Euros at the end, at a rate of:

25 points = 1 Euro.

At the end of the experiment, you will be paid, in cash, the number of points you will have earned during the experiment. In addition to this sum, you will receive payment of 4 Euro for showing up at this experiment.

The experiment consists of at least 50 periods.

After period 50, a draw will decide in each period whether there shall be a further period. With a probability of 75%, there will be a period 51. Should there be a period 51, there will be a period 52 as well, once again with a probability of 75%, etc.

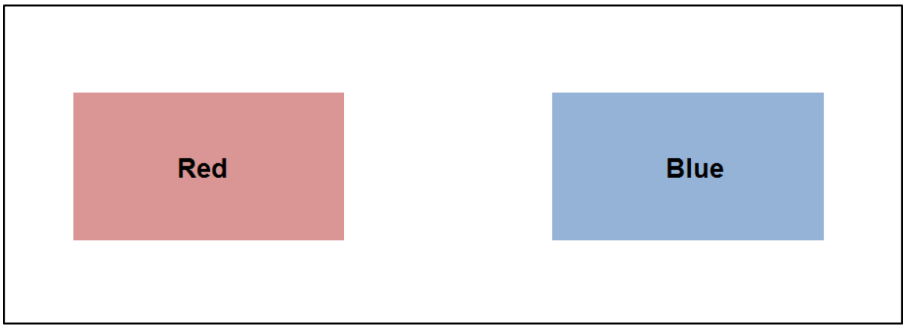
At the beginning of the experiment, participants will be randomly divided into groups of six. Apart from you, your group will therefore be made up of another 5 members. The constellation of your group of six will remain unchanged throughout the entire experiment.

[39] We thank Brian Cooper from the MPI for Collective Goods for the translation.

Also at the beginning of the experiment, the computer will name the participants of each group of six, assigning to each a randomly drawn letter (a, b, c, d, e, or f). Each participant in the group is equally likely to receive a particular letter (a, b, c, d, e, f). Each letter is distributed once in each group of six.

In each period, you will interact with exactly one of the other participants from your group. The computer will randomly determine at the beginning of each period who that other player is. The other 4 participants in your group of six will each also be randomly matched with another participant from the group. In total, there will hence be three parallel encounters in your group in each period.

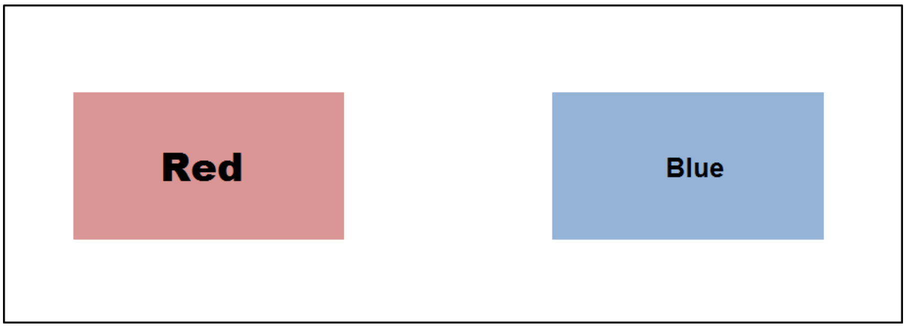
In each period, your task is to choose one of two decision fields:



How many points you earn in a period depends on your decision as well as on the decision of the participant with whom you are interacting.

- If you choose "Red" and the other participant chooses "Blue", you will earn 10 points, and the other participant will earn 1 point.
- If you choose "Blue" and the other participant chooses "Red", you will earn 1 point, and the other participant will earn 10 points.
- If both participants choose "Red", you will both earn 0 points.
- If both participants choose "Blue", you will both earn 0 points.

In each period, one of these fields will be in bold:



Whenever you see the field “Red” in bold, the other participant sees the field “Blue” in bold, and vice versa. You are free to decide whether you wish to follow the marking or not.

The computer decides on the basis of your letter which field is in bold. Whichever participant’s letter comes first in the alphabet sees the field “Red” in bold. If, for example, the computer assigned you the letter c at the beginning of the experiment, and you interact with participant d, e, or f, you will see “Red” in bold. If you interact with participant a or b, however, you will see “Blue” in bold.

For example, if you were assigned the letter a at the start, “Red” will be in bold in all periods. If you are participant f, “Blue” will always be in bold, etc.

Only once both participants have made their decisions will you find out what the other participant has chosen.

At the end of each period, your computer screen will give you an overview of:

- which field you have opted for;
- which field the other participant has chosen;
- the income you and the other participant have each earned in this period;
- how the participants of the other encounters have chosen.

Further, you have the chance to transfer to the other participant any part of your income from the current period. To do this, enter on your screen the number of points you wish to transfer to the other participant, and confirm your entry by clicking “Continue”. You are free to decide whether or not you wish to transfer points and, if you do, how many points you wish to donate.

Further, you have the chance to transfer to the other participants any part of your income from the current period. To do this, enter on your screen the number of points you wish to transfer to the other participants, and confirm your entry by clicking "Continue". You are free to decide whether or not you wish to transfer points and, if you do, how many points you wish to donate.

If you earned 10 points in the current period, your transfer goes into a pool, whose content is payed out equally to all participants who earned 1 point in the current period. If you earned 1 point in the current period, your transfer goes into a pool, whose content is payed out equally to all participants who earned 10 point in the current period.

Subsequently, the computer will automatically transfer some part of your income from the current period to the other participant. The amount transferred can vary from period to period.

In addition, your computer screen will give you an overview of:

- the number of points transferred by you to the other participant;
- the number of points the other participant has transferred to you;
- the income you have earned in this period, after transfers;
- the number of points transferred by you to the respective pool;
- the number of points payed out to you from the respective pool;
- the income you have earned in this period, after transfers;
- the number of points the computer has automatically transferred to the other participant;
- the number of points the computer has automatically transferred to you from the other participant;
- the income you have earned in this period, after transfers;
- the total income you have made up to now;
- the total income each of the other participants in your group of six has made so far

In the next period, you will once again be randomly matched with one other participant from your group of six, with whom you will then interact.

Do you have any questions? If yes, please raise your hand. We will come to you.

A.4 Post-Experimental Tests

Other-regarding preferences. Other-regarding preferences were measured using the social value orientation (SVO) slider measure (Murphy et al. 2011). The slider measure consists of 15 modified dictator games in which players allocate money between themselves and another player. Players are characterized on a continuous type space ranging from competitiveness and individualism to prosociality and altruism.

Risk. The risk elicitation consisted of 1 general risk question and 6 domain-specific questions. The general question read: "Are you, generally speaking, a person willing to take risks or do you rather try to avoid risks?" The domain-specific questions read: "How would you rate your willingness to take risks in the following domains...(i) when driving a car, (ii) in financial investments, (iii) in leisure and sports, (iv) in your carreer, (v) concerning your health, (vi) when trusting unfamiliar people?". There are 10 answer options ranging from *not at all willing to take risks* to *very willing to take risks*. We use the arithmetic mean over the 7 questions as our measure of an individual's risk attitude.

Trust. The trust questions read: "Please rate the following three statements: (i) Generally, people can be trusted. (ii) Nowadays you cannot trust anybody. (iii) When dealing with strangers it's better to be careful before trusting them." The answer options are: *fully agree*, *rather agree*, *rather disagree*, *fully disagree*. The composite trust measure is the arithmetic mean of the three question whereby the first is coded negatively in the other two positively.

A.5 Additional Results

		$m = concede$								
		$a = claim$			$a = concede$					
$m = claim$	$a = claim$	nT	51%	1222	**nT**	**42%**	**1011**	**nT**	**93%**	**2233**
		Td	29%	704	**Td**	**63%**	**1516**	**Td**	**93%**	**2220**
		Tp	33%	790	**Tp**	**58%**	**1381**	**Tp**	**90%**	**2171**
		Ta	21%	496	**Ta**	**71%**	**1711**	**Ta**	**92%**	**2207**
	$a = concede$	nT	5%	118	nT	2%	49	nT	7%	167
		Td	4%	95	Td	4%	85	Td	8%	180
		Tp	6%	151	Tp	3%	78	Tp	10%	229
		Ta	3%	73	Ta	5%	120	Ta	8%	193
		nT	56%	1340	**nT**	**44%**	**1060**			
		Td	33%	799	**Td**	**67%**	**1601**			
		Tp	39%	941	**Tp**	**61%**	**1459**			
		Ta	24%	569	**Ta**	**76%**	**1831**			

Table A1: Claiming and Conceding over Treatments

Relative and absolute frequencies of stage 1 behavior in *no-T* (nT), *T-direct* (Td), *T-pool* (Tp), and *T-admin* (Ta). We report data from periods $1 - 50$. Per treatment, we thus have 4800 observations (96 subjects $\times$ 50 periods) on the variable $a = \{claim, concede\}$, half of which saw the message $m = claim$ and $m = concede$, respectively. Behavior consistent with the bourgeois equilibrium ($a_i = m_i$) is shown in **bold**.

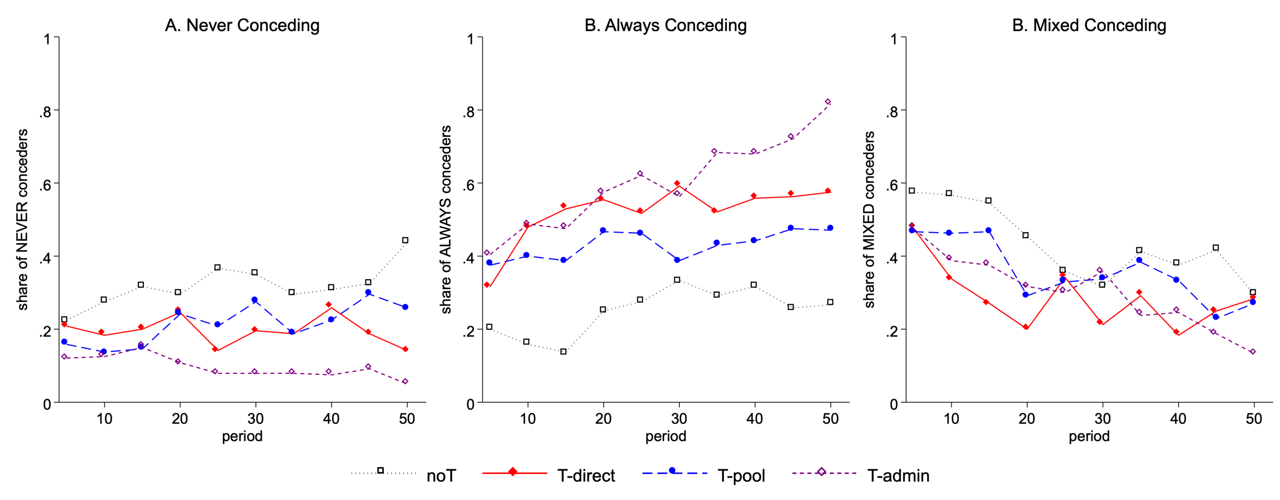


Figure A2: Conceding over Time
Relative frequency of individuals who, within a block of 5 periods, (A) never conceded, (B) always conceded, or (C) sometimes conceded when receiving the message $m = concede$. Within each block, individuals are weighted by the number of periods they received $m = concede$.

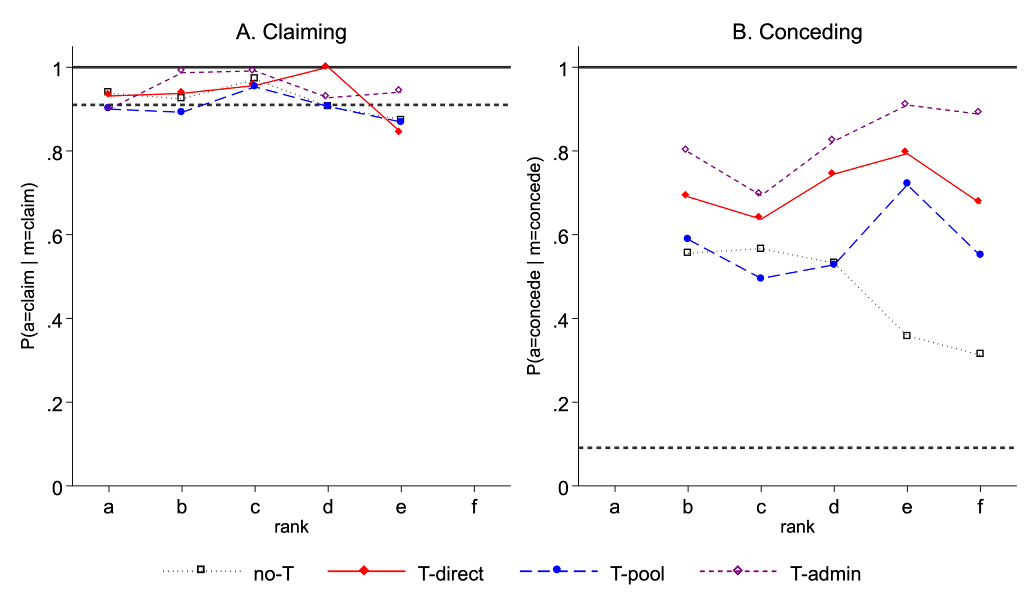


Figure A3: Compliance with the Status Quo (last 10 periods)
Mean relative frequency of complying with the exogenous recommendation when one's message is *claim* (A) or *concede* (B).

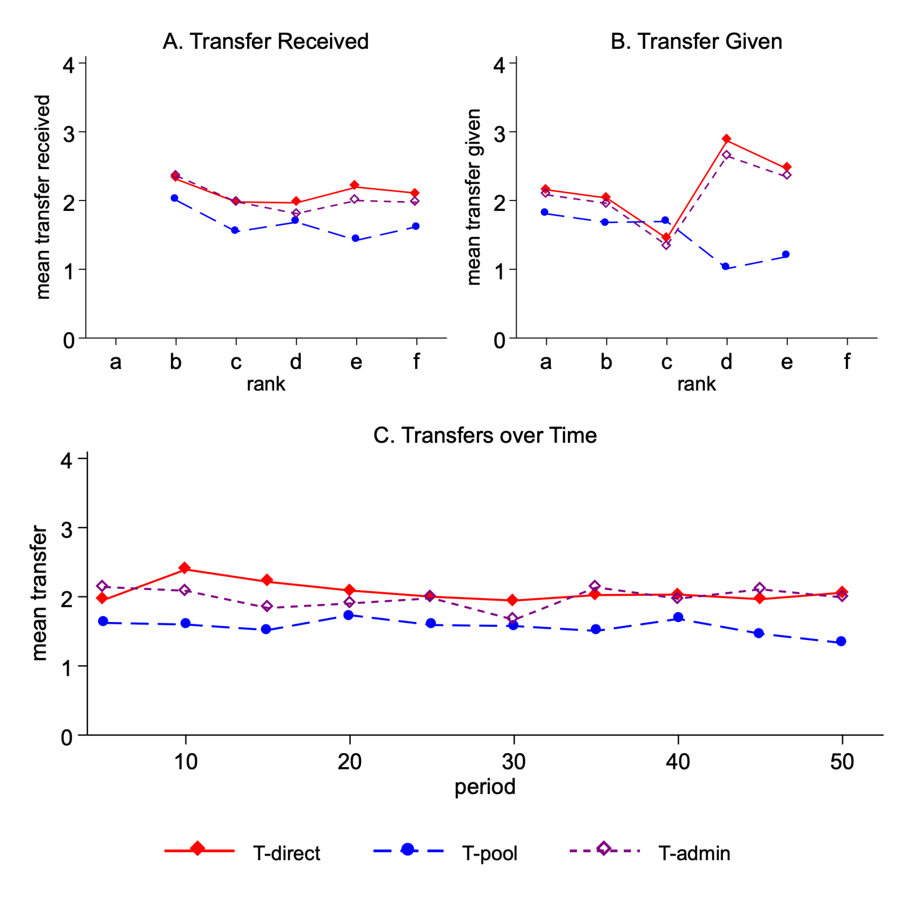


Figure A4: Transfers

Transfers in *T-direct* and *T-pool* were choices of the experimental participants. Transfers in *T-admin* were randomly drawn from the empirical distribution of transfers made by the experimental participants in *T-direct*.

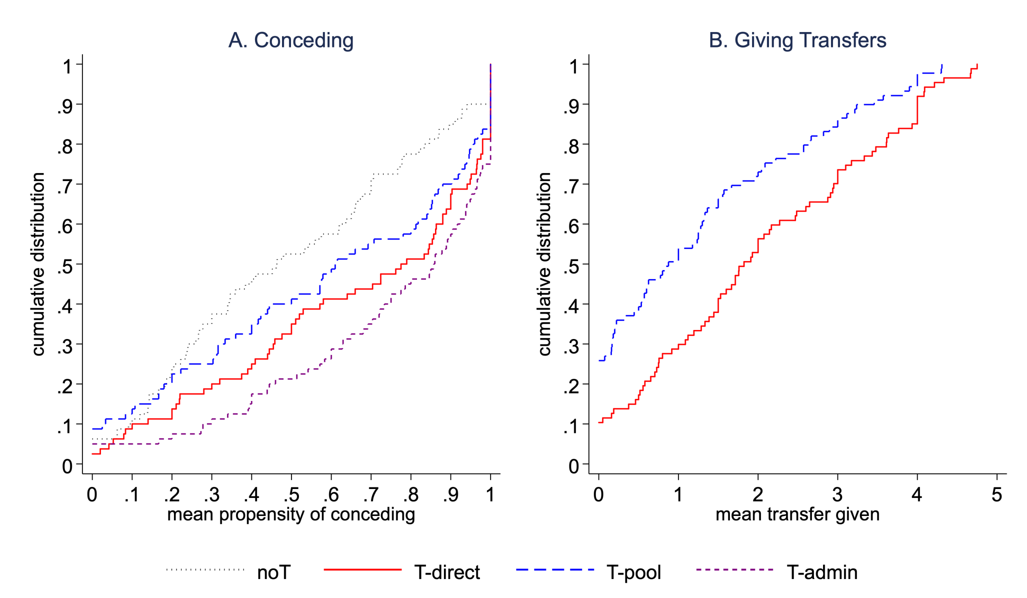


Figure A5: Individual willingness to (A) concede and (B) transfer

Panel A: Propensity to concede, by individual and treatment. *Panel B:* Mean transfer given, by individual and treatment, after both players played $a_i = m_i$.

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