

Supplemental Materials for:

A Desire for Equality Produces Inequality in Social Hierarchies when People Focus on
Categories of Recipients Rather than Individuals

Overview

This document includes a supplementary Table S1 which summarizes all the differences between our preregistrations and manuscript. Although we have sought to report all important deviations in the main manuscript – but shortly in order to maintain readability – here we offer out of an abundance of caution a complete overview of them and document every deviation in detail. We also explain for each why these deviations do not affect the validity of our findings.

In addition, this document contains *additional analyses* of Experiments 2-6. The additional analyses aim to reveal the robustness of the findings reported in the main manuscript, following either our preregistered exploratory analyses, or suggestions raised by anonymous reviewers. Reassuringly, we found that our main central main effects and interaction effects remained significant or became even stronger after controlling for possible confounding variables, and that analyzing the data in different approaches also confirmed the predictions examined in the main manuscript. Together, these additional results confirm that the central effects presented in the main manuscript are robust.

This document also contains one *additional experiment* that was not reported in the main manuscript: we preregistered it as a replication of Experiment 2, but due to subtle translation issues it produced unexpected results, which (after interpretation) led us to formulate the hypotheses that we then tested in a confirmatory manner as Experiment 5 in the main manuscript. For clarity, we therefore refer to it as Experiment 5b, given that it serves as a pilot and conceptual replication of Experiment 5 in the main manuscript.

Supplements: Recipient unit and Inequality

Table S1

Summary of deviations from preregistrations in the main manuscript

Types of deviation	Specific deviation		Reasons of deviation	Involved experiments	Implications of deviation	Efforts to warrant transparency
	Preregistration	Manuscript				
Change the term describing the variable	The IV was described using different terms including Categorical vs. Individual focus and Categorization vs. Individualization.	The IV was described as Recipient unit: Categories vs. Individuals	To increase consistency in the description of the variable across the manuscript, and to better align our terminology in the Method sections with our theorizing	Experiments 1, 2, 4, 5, 6		Add a specific instruction to our ResearchBox.
---same as above---	The moderator was described as Consideration of opposite principle: no vs. yes.	The moderator was described as Opposite equality principle: activated vs. control		Experiment 4a	Does not influence the conclusion, because they are different technical descriptions of the same manipulation or procedure.	Include the raw manipulation instructions when reporting the procedure.
---same as above---	The moderator was described as Categorical equality: control vs. suppressed.	The moderator was described as Individual equality principle: control vs. activated		Experiment 4b		Include the raw manipulation instructions when reporting the procedure.
---same as above---	The moderator was described as Organization structure: hierarchical versus non-hierarchical.	The moderator was described as Relative rank of smaller-sized group: higher vs. equal		Experiment 6		Add a specific instruction to our ResearchBox.
Extend preregistered analysis	Exploratorily test whether our manipulation influenced the amount of rewards assigned to participants themselves.	Systematically compare the effect of our manipulation and the effect of selfishness	To further explore the phenomenon, as recommended in the peer-review process.	Experiment 3	Does not affect our main conclusion and adds more supportive evidence.	Use separate headings to mark these deviations when reporting the results.
---same as above---	Make a general moderation prediction that Relative group size moderates the effect of recipient unit	Report the specific pattern of moderation (i.e. the moderator reduces the effect but not reverses it).		Experiment 5		
Change the analysis plan	Use repeated-measure ANOVA to analyze the interaction effect between Recipient unit and Recipient role on the average reward allocated to each role.	Use one-factor ANOVA to analyze the effect of Recipient unit on inequality (difference between the average rewards allocated to different roles).	To simplify the presentation of results.	Experiments 2a, 2b ,2c, 5	Mathematically identical, given the fixed-pie distribution tasks.	Explicitly acknowledge this change when reporting the results of Experiment 2.

Experiment 2a: Additional Analyses

Our experimental design in Experiments 2a-2c involves two variables that may affect distributive inequality (in addition to the experimental manipulation): Relative group size and perceived importance of different roles. Although participants generally assigned fewer members to the higher-ranked than lower-ranked group, as we expected them to do, they differed in the degree, with some assigning to different groups on their own. This led to variations in relative group size. In addition, we also measured the degree to which participants perceived higher- and lower-ranked group members as important, which we assumed might influence the degree to which participants distinguished between these two roles in their distributions. We therefore test our central prediction after statistically controlling for these two variables.

As part of the procedure, participants were first instructed to assign the ten employees to the two roles (Idea-giver and Laborer). Reassuringly, our recipient unit manipulation did not affect the number of employees assigned to each of the two roles, $F(1, 98) = 0.78, p = .379, \eta_p^2 = 0.008$. We also measured the perceived importance of both roles. As expected, participants considered Idea-giver more important ($M = 6.30, SD = 0.90$) than Laborers ($M = 5.45, SD = 0.80$), $F(1, 99) = 74.26, p < .001, \eta_p^2 = 0.429, d = 0.86, 95\% CI = [0.63; 1.10]$. Our recipient unit manipulation did not affect difference in perceived importance of both roles, $F(1, 98) = 0.01, p = .947, \eta_p^2 < 0.001, d = 0.01, 95\% CI = [-0.38; 0.41]$.

Consistent with our explanation of the central hypothesis in terms of the application of equality principles, controlling for these two variables (i.e. relative group size and difference in perceived importance of different roles) left the central effect of recipient unit on inequality significant, independent of whether these variables are controlled as covariates in an ANCOVA, $F(1, 96) = 11.78, p < .001, \eta_p^2 = 0.213$, or included in a Linear Mixed Model

as random intercepts (with recipient unit serving as the fixed effect in this model), $\beta = -0.310$, $SE = 0.089$, $t = -3.49$, $p < .001$.

Experiment 2b: Additional Analyses

As in Experiment 2a, recipient unit did not affect the number of employees assigned to each of the two roles, $F(1, 98) = 1.768$, $p = .187$, $\eta_p^2 = 0.018$. Participants considered Managers more important ($M = 6.09$, $SD = 0.74$) than Workers ($M = 5.65$, $SD = 0.82$), $F(1, 99) = 21.38$, $p < .001$, $\eta_p^2 = 0.178$, $d = 0.46$, 95% CI = [0.26; 0.67]. Different from Experiment 2a, the difference in the perceived importance of both groups was larger when recipient units were presented as individuals ($M_{\text{diff}} = 0.64$, $SD = 0.83$) than when recipients were categories ($M_{\text{diff}} = 0.24$, $SD = 1.02$), $F(1, 98) = 4.5$, $p = .036$, $\eta_p^2 = 0.044$, $d = 0.43$, 95% CI = [0.02; 0.83].

Consistent with our explanation, controlling for relative group size and difference in perceived importance left the central effect of recipient unit on inequality significant and (descriptively) even stronger, independent of whether these variables are controlled as covariates in an ANCOVA, $F(1, 96) = 15.40$, $p < .001$, $\eta_p^2 = 0.138$, or included in a Linear Mixed Model as random intercepts, $\beta = -0.281$, $SE = 0.104$, $t = -2.70$, $p = .009$.

Experiment 2c: Additional Analyses

Unexpectedly, participants assigned slightly more employees to the high-skilled (and fewer to the low-skilled) role when recipient units were presented as individuals, than they did when recipient units were presented as categories, $F(1, 115) = 4.61$, $p = .034$, $\eta_p^2 = 0.039$. Note that this is a violation of random assignment as the recipient units were only introduced after participants finished the hiring task. Experiment 2c also included the 6-item equity Moral Foundation subscale of the MFQ (Skurka et al., 2020, $\alpha = .86$, $M = 4.35$, $SD = 1.29$).

We also tested the moderating role of this moral foundation, following our preregistered exploratory analysis, but we found that equity moral foundation did not moderate the effect of recipient unit on distribution, $F(1, 113) = 2.82, p = .096, \eta_p^2 = 0.024$.

Controlling for relative group size and equity moral foundation slightly reduced the effect of recipient unit manipulation, independent of whether these variables are controlled as covariates in an ANCOVA, $F(1, 113) = 3.77, p = .055, \eta_p^2 = 0.032$, or included in a Linear Mixed Model as random intercepts, $\beta = -0.172, SE = 0.089, t = -1.94, p = .055$. Although this reduction of effect is small and Experiments 2a and 2b did not find that such a violation of random assignment affected the central effect, we nonetheless changed the experimental design in Experiments 2d and 3 to avoid it. Here, we set the amounts of higher- and lower-ranked group members as fixed numbers in Experiments 2d and 3 (i.e. 2 higher-ranked and 8 lower-ranked group members). The advantage of this design choice is that it fully eliminates any possible confounding influence caused by between-condition difference in relative group size, because it keeps relative group size constant. As presented in our main manuscript, the effect of recipient unit on inequality was replicated in these two experiments and even became descriptively two times stronger. That said, we maintain that there is an advantage of the flexible group sizes because it is more realistic and involves participants more with the distribution, thus adding to the significance of any inequality resulting from the manipulation.

Experiment 4b: Additional Analyses

An anonymous reviewer of an earlier version of this manuscript, suggested a different way of decomposing the interaction between recipient unit and equality principle. Following this suggestion, we also decomposed the interaction effect by comparing estimated marginal means within the Categorical recipient and within Individual recipient unit condition. This leads to the finding that applying the individual equality principle among those who

perceived recipients as categories did significantly reduce the perceived fairness of the inequality ($M = 2.50$, $SD = 1.64$) compared to the control condition ($M = 3.02$, $SD = 1.94$), $t(1291) = -4.02$, $p < .001$, $d = -0.32$, 95% CI = [-0.47; -0.16], while applying categorical equality principles to those who perceived recipient units as categories did not significantly influence fairness judgment ($M = 2.28$, $SD = 1.45$) compared to the control condition ($M = 2.35$, $SD = 1.43$), $t(1291) = -0.56$, $p = .5578$, $d = -0.04$, 95% CI = [-0.20; 0.11]. In other words, these results suggest that the individual application of equality principle has a stronger effect than its categorical application, if these two applications of the equality principle compete. Nonetheless, our findings show that people still apply equality principle categorically when they perceive the recipient units as categories, if not prompted to consider equality at the individual level.

Experiment 4b: Additional Analyses

Note that Experiments 2d, 3, and 4a used fixed number of recipient units, but Experiment 4b used flexible numbers, as in Experiments 2a-c. The number of employees assigned to each of the two roles did not differ between conditions, $F(1, 398) = 0.054$, $p = .817$, $\eta_p^2 < 0.001$. As expected, participants considered Managers more important ($M = 6.17$, $SD = 0.82$) than Workers ($M = 5.57$, $SD = 0.95$), $F(1, 399) = 117$, $p < .001$, $\eta_p^2 = 0.227$, $d = 0.54$, 95% CI = [0.44; 0.65]. The difference in the perceived importance of both groups was larger when recipient units were presented as individuals ($M_{\text{diff}} = 0.95$, $SD = 0.98$) than when recipients were categories ($M_{\text{diff}} = 0.26$, $SD = 1.14$), $F(1, 398) = 42.3$, $p < .001$, $\eta_p^2 = 0.096$, $d = 0.65$, 95% CI = [0.44; 0.86]. We tested whether these variables explained the observed effect but reassuringly found, after controlling for relative group size and difference in perceived importance, that our central effect in this experiment – the moderation effect between recipient unit and principle activation remained significant, independent of whether

these variables are added as covariates in an ANCOVA, $F(1, 394) = 4.03, p = .045, \eta_p^2 = 0.010$, or included in a Linear Mixed Model as random intercept, $\beta = 0.432, SE = 0.200, t = 2.16, p = .031$.

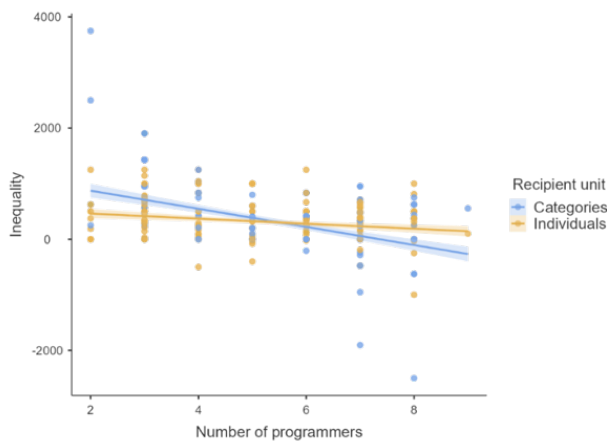
Experiment 5: Additional Analyses

In our main manuscript, we test the moderating role of the Higher-ranked Group's Relative Size by suggesting participants to hire fewer, equal, or more programmers than assistants, depending on condition. We test our prediction using condition as a nominal moderator. For exploratory purposes (preregistered as such) and to gain more power, we also tested the moderating role of Relative Group Size by using the number of higher-ranked group members (vs. lower-ranked group members) assigned ("hired") by the respondents as a continuous moderator, with theoretical values ranging from 1 programmer (9 assistants) to 9 programmers (and 1 assistant). Using the PROCESS Macro (Model 1; 5,000 bootstrap resamples), we found a significant interaction between recipient unit and group size, $F(1, 596) = 34.75, p < .001, \eta_p^2 = 0.055$. This thus supports the theoretical reasoning in the Main Manuscript. Using the Johnson-Neyman procedure, we found that when the number of higher-ranked group members (i.e. programmers) was below 4.9, changing recipient units from individuals to categories significantly (at $p < .05$) increased inequality. In contrast, when the number of higher-ranked group members was over 6.2, considering recipient units as categories significantly decreased inequality compared to considering individual recipients. See Figure S1.

As before, the interaction effect between recipient unit and relative group size was significant after controlling for difference in perceived importance of different groups, independent of whether that was added as a covariate in an ANCOVA, $F(2, 593) = 6.87, p$

$= .001$, $\eta_p^2 = 0.023$, or included in a Linear Mixed Model as a random intercept, $\beta = 0.396$, $SE = 0.129$, $t = 3.07$, $p = .002$.

Figure S1

Results of Experiment 5

Note. Presenting recipient units as categories (blue) increases inequality compared to presenting them as individuals (yellow), but only when the higher-ranked group is smaller than the lower-ranked group, however this effect is reversed when the higher-ranked group members is larger than lower-ranked group.

Additional Experiment 5b

The original aim of Experiment 5b was to test the same hypothesis as Experiment 2c. However, we did not instruct our American participants to hire fewer higher-ranked group members than lower-ranked group members (given that our Chinese participants reliably did so in Experiments 2a and 2b, even without instruction, possibly reflecting cultural differences in organizational culture or subtle differences in the logic of conversation between the Chinese and English instructions). As a result, a non-trivial number of participants in Experiment 5b hired more higher-ranked group members than we expected. Although this made the current experiment deviate strongly from Experiments 2a-2c, it offered us an

opportunity to initially examine the interaction between recipient unit and relative size of higher-ranked group – similar to as tested in Experiment 5 (Main Manuscript). In a sense, Experiment 5b thus served as a non-preregistered pilot study to Experiment 5 (it was also conducted prior to that study). Here we report it for completeness.

Method

Participants and Design

In return for \$1, 100 Americans recruited via Cloud Research (38 women, 60 men, 2 other; $M_{\text{age}} = 36.76$, $SD_{\text{age}} = 7.88$) participated in the experiment and were randomly assigned to one of two conditions (Recipient unit: categories vs. individuals). We kept the sample size identical to that of Experiment 2a, which provides more than 95% power to detect the effect found there ($d = 0.665$).

Procedure

The procedure was quite similar to Experiment 2c, except that the two categories we used were senior and junior engineer. A more important difference is that we did *not* suggest participants to hire more juniors and fewer seniors. Participants first hired 10 employees and decided how to divide them into two categories: senior or junior engineers. Participants were told that senior engineers are more professional and skillful than the junior engineers.

Afterwards, participants distributed \$10,000 end-of-year bonus, either by doing so categorically (per group) or individually (for each of the 10 employees). In addition, we also measured participants' political preference (between Republicans and Democrats), collectivism orientation and moral foundation (equity and proportionality subscales).

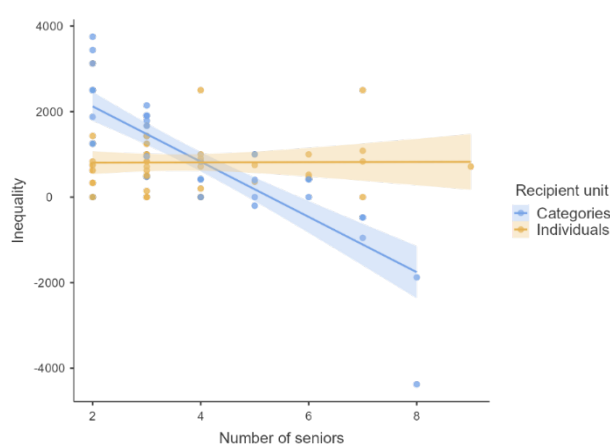
Results

Testing the predicted main effect of the recipient unit manipulation, we did not find the predicted effect, $F(1, 98) = 0.34$, $p = .563$, $\eta_p^2 = 0.003$, $d = 0.12$, 95% CI = [-0.28; 0.51].

As a post-hoc explanation, we found that the average number of seniors that participants

selected to be quite high ($M = 3.73$, $SD = 1.66$). Indeed, this number was significantly higher than the number that participants hired in Experiment 2c, where they were instructed to hire more juniors and fewer seniors ($M = 2.65$, $SD = 0.90$), $t(215) = 6.06$, $p < .001$, $d = 0.83$, 95% CI = [0.55; 1.10]. Using the PROCESS Macro (Model 1; 5,000 bootstrap resamples), we tested whether this explains the null-result. Indeed, we found a significant interaction between recipient unit and number of seniors, $F(1, 96) = 53.29$, $p < .001$, $\eta_p^2 = 0.357$. Johnson-Neyman procedure showed that when the number of higher-ranked group members (i.e. senior engineers) was below 3.6, presenting recipient units as categories significantly (at $p < .05$) increased inequality compared to presenting them as individuals. In contrast, when the number of higher-ranked group members was over 4.5, presenting recipient units as categories significantly decreased inequality compared to presenting them as individuals. Although not predicted, these findings thus post hoc support the theoretical reasoning in Experiment 5 of the Main Manuscript. See Figure S2.

Figure S2

Results of Experiment 5b

Note. Presenting recipient units as categories increases distributive inequality compared to presenting them as individuals when the number of higher-ranked group members (i.e. senior

engineers) is fewer than lower-ranked group, however this effect is reversed when the number of higher-ranked group members is more than lower-ranked group.

Experiment 6: Additional Analyses

In Experiment 6 the labels of the two groups are counter-balanced in one experimental condition (i.e. workers focusing on either input or output units of the TPS sensor) and therefore we did not measure the perceived group importance. Consistent with other experiments, we still find that controlling for relative group size left the moderation effect between recipient unit and relative group rank significant (though descriptively reduced), independent of whether that is added as a covariate in an ANCOVA, $F(1, 791) = 3.85, p = .050, \eta_p^2 = 0.005$, or included in a Linear Mixed Model as random intercepts, $\beta = 0.086, SE = 0.044, t = 1.96, p = .050$.

An anonymous reviewer of an earlier version suggested analyzing distributive outcomes as a dichotomous variable and distinguish instead between totally equal distribution (inequality = 0) and unequal distributions (inequality $\neq$ 0, recoded as 1) would offer a more parsimonious test of our prediction. We thus deviated from our preregistration and transformed inequality into a dichotomous variable. We found that a majority of participants in the Equal-Rank condition (79.8%) distributed completely equally between recipients, which thus suppressed any possible effect of recipient unit, while only 5.0% participants in the Higher-Rank condition did so, $\chi^2(1) = 456.52, p < .001$. This result is theoretically consistent with our moderation prediction, by showing that when the proportionality and equality principles were misaligned in the Equal-Rank condition, the effect of recipient unit was strongly reduced.