Inequality Aversion When the Reward is Scarce: 
The Case of Salary vs. Equity Compensation

Jiayi Bao* Andy Wu†
January 1, 2018

Running Head: Inequality Aversion When the Reward is Scarce

*Jiayi Bao: The Wharton School of the University of Pennsylvania, Business Economics and Public Policy Department. 3000 Steinberg Hall-Dietrich Hall, 3620 Locust Walk, Philadelphia, PA 19104, USA. E-mail: jiayibao@wharton.upenn.edu. Corresponding author. This work was supported by the Mack Institute for Innovation Management and Wharton Risk Management and Decision Processes Center.

†Andy Wu: Harvard Business School, Harvard University, Strategy Unit. 15 Harvard Way, Morgan Hall 243, Boston, MA 02163. E-mail: awu@hbs.edu. This work was supported by the HBS Division of Research and Faculty Development.
Inequality Aversion When the Reward is Scarce: The Case of Salary vs. Equity Compensation

Abstract

Do workers have different equality preferences depending on the type of payoff? In many firms, the distribution of equity compensation is more equal than the distribution of salary. We design an experimental group production game to examine how workers respond to combinations of different distributions of equity and salary. Results suggest that workers view salary and equity in two separate domains, and they are more inequality averse in the equity domain. Furthermore, inequality aversion in equity is more severe than in salary because equity is perceived as the more scarce reward when shown in percentage form.

Keywords: Inequality Aversion, Group, Compensation, Equity, Scarcity, Experiment

JEL Classification Codes: C91, C92, D03, J31, J33, M52
1 Introduction

Traditional theory suggests that equity compensation, which links worker compensation to the performance of the overall firm, can incentivize worker performance (Jensen and Meckling, 1976) by rewarding workers for the value they add to the firm, which in turn helps retain them (Fama, 1980), more so than just cash salary compensation not directly linked to firm performance. Accordingly, these incentives will be strongest for workers whose actions are most closely linked to firm performance, such as those with higher rank or more important function. To optimize on this incentive, firms may choose to disproportionately allocate their scarce equity compensation pool to these workers and increase the inequality of equity compensation.

In contrast, an extensive body of theoretical and empirical work, focusing predominantly on cash salary compensation, suggests that inequality in within-firm compensation structure may have negative effects on worker performance. For workers at the low end of the compensation scale, compensation inequality violates their sense of fairness, reducing reported job satisfaction (Clark and Oswald, 1996) and decreasing worker productivity (Akerlof and Yellen, 1988, 1990). Even workers at the high end of the compensation scale may be more concerned with achieving equality rather than sustaining an advantageous compensation position, as competitive comparative preferences may correlate with unhappiness (Charness and Kuhn, 2007). Wage compression can reinforce a sense of cohesiveness within the firm, leading to superior worker behavior (Levine, 1991). Taken together, these effects on worker productivity imply that firms may choose a more compressed compensation structure that understates differences in worker marginal product (Frank, 1984). This effect has been empirically observed in a number of studies on efficiency wages; for example, group-based pay plans generally reduce pay differentials. While these existing studies focus on what might be characterized as salary-only compensation structures, these same effects might apply to equity compensation. These two forces for inequality in compensation—an incentive to over-allocate to workers closely tied to firm performance vs. a disincentive from negative social
pressures—trade-off against one another as firms design an overall compensation structure consisting of both salary and equity compensation. However, the prior literature does not address the possible distinction between inequality in equity compensation as opposed to inequality in salary compensation.

It is an open question as to whether and how inequality in one form of compensation may have differential effects on worker productivity than inequality in another form of compensation. Anecdotal evidence suggests that workers may be asymmetrically averse to inequality across the two compensation domains, and firm-level compensation structures are being designed in response to this. Consider the case of the technology sector, where compensation packages consisting of both salary and equity are common for all workers, from management to entry-level.¹ Several major technology firms—such as the online payment firm Stripe, the video streaming service Twitch, the job search engine Indeed, and the online dating platform eHarmony—exhibit an equality-in-equity compensation strategy, i.e., they offer potential employees the same levels of equity compensation but very different salaries across different job ranks and functions.² Joel Spolsky, the co-founder and CEO of the technology firm Stack Exchange, argues that equity in particular should be “split equally among everyone in the layer,” where the layer refers to employees hired in the same cohort as opposed to founders or investors, because “fairness, and the perception of fairness, is much more valuable than owning a large stake.” Even when equality is preferred by employees in equity allocations, in some cases workers may even prefer outright inequality in salary.³

We aim to shed light on two questions: Do workers have distinct preferences for equality in equity versus equality in salary? If so, what are the mechanisms driving the different equality preferences? In this paper, we propose a novel behavioral theory of domain-contingent inequality aversion, where “domain” refers to the payoff form.⁴ Building off of the general notion of inequality aversion (Fehr and Schmidt, 1999), we argue that workers dislike inequality and their preferences may differ depending on the type of compensation. The established construct of inequality aversion stems from behavioral observations that individuals are con-
cerned about their social standing and economic payoffs relative to others (Bracha et al., 2015; Bolton and Ockenfels, 2000; Charness and Grosskopf, 2001; Clark and Oswald, 1996; Marr and Thau, 2014), and they prefer equality under certain circumstances. He and Villeval (2017) further find that individuals express more inequality aversion when making proposals to the group than when they decide in isolation, suggesting that equality preferences may differ depending on the decision-making environment. Our concept of domain-contingent inequality aversion adapts such a context-dependent view of inequality aversion and extends the basic theory by postulating that workers view cash salary and equity compensation as distinct domains that impact individual inequality aversion differently, that is, employees may dislike inequality in formal equity ownership more than inequality in cash salary.

We incorporate domain-contingent inequality aversion into a theoretical model to derive the results for workers’ effort choices. We show that inequality in equity has a negative asymmetric effect on effort while inequality in salary may have a positive asymmetric effect on effort. The negative asymmetric effect of inequality in equity distinguishes the domain-contingent inequality aversion model from standard models of inequality aversion. We then hypothesize that one driver of domain-contingent inequality aversion is the perceived scarcity of equity, and the negative asymmetric effect of inequality in equity is more likely to be present when equity is presented and perceived as scarce. Most firms have a limited amount of equity—a set percentage of the firm in their options pool—to distribute, and employees may then perceive equity rewards as a scarce commodity. While scarcity can induce higher preference for the scarce good (Balachander et al., 2009), Hegtvedt (1987) and Effron and Miller (2011) find that people are less selfish with respect to distributions when rewards are scarce. Finally, we consider the firm-level implication of domain-contingent inequality aversion by assuming that management takes such worker preferences into account and optimizes the compensation strategy over the entire group of employees. We argue that, in the presence of a negative asymmetric effect of inequality in equity and a positive asymmetric effect of inequality in salary, the equality-in-equity strategy is optimal for firms with a fixed
To test our model predictions, we conduct an experiment to identify domain-contingent inequality aversion and whether these worker preferences are driven by equity scarcity. In a within-subject design, participants experience 7 scenarios of group production with different compensation schemes reflecting varied distributions of salary and equity. Participants can increase the probability of group success at a personal cost. We complement the experiment with a between-subject design to test whether the mechanism of equity scarcity drives domain-contingent inequality aversion. In the control group, participants view equity in a non-scarce format, i.e., experiment points. In the treatment group, participants view equity in a scarce format, i.e., as a percentage. The only difference between the two groups is the presentation of equity, mirroring the forms that equity compensation is presented to employees in practice. We verify in a separate survey that equity is perceived as more scarce when presented in a percentage than when presented in experimental points. Our experiment offers evidence for the existence of domain-contingent inequality aversion. We further find evidence that inequality aversion in equity is more severe because of a perceived scarcity of equity instead of cash, as the negative asymmetric effect of inequality in equity only appears when equity is presented in the percentage form that facilitates perception of scarcity.

This paper makes several contributions. First, we propose a behavioral theory of domain-contingent inequality aversion, which represents a new consideration for the labor economics and management literature on the subject of employee incentive compensation and its link to worker and firm performance. We are the first to highlight the distinction between inequality in equity compensation and inequality in salary compensation. In the spirit of Chen and Li (2009), who argue that social preferences for equality depend on the identity of the comparison group, we argue that social preferences for equality also depend on the domain where the inequality occurs. Second, we provide experimental results for how individuals respond to intra-group compensation distributions when different types of payoffs are used simultaneously. Using output share to mimic equity and flat payment to mimic salary, we are
also the first to test experimentally how compression in output share affects individual contribution when flat payment is present and when the value of the share is uncertain. Third, we shed light on the mechanism of domain-contingent inequality aversion by linking scarcity bias and social preferences. Fourth, as equity is becoming increasingly a popular component of compensation, our findings have practical implications, particularly for technology firms, for the optimal allocation of equity among their workers.

The paper proceeds as follows. Section 2 presents our theoretical model of domain-contingent inequality aversion. Section 3 lays out the experimental design and Section 4 discusses the results. Section 5 concludes.

2 Theoretical Model

We present a model of domain-contingent inequality aversion that builds upon a standard group production model with stochastic output and convex cost function (Nalbantian and Schotter, 1997) but adopts a different stochastic form. Adapting the fairness model of Benjamin (2015), we assume inequality aversion of the form in Fehr and Schmidt (1999). Under domain-contingency, we write distinct functions for inequality aversion in salary and inequality aversion in equity. We employ this model to generate hypotheses that we test experimentally.

2.1 Model Setup

We consider two risk-neutral workers in a firm engaged in a group task with output exerting effort with homogeneous cost function The individual payoff consists of a salary and an equity payoff which is a share of the group output \( \tilde{V} \).
The group production process is a binary lottery where

$$V = \begin{cases} V, & \text{with probability } p(e_1 + e_2) \\ 0, & \text{otherwise.} \end{cases}$$

Group “Succeeds”

Group “Fails”

assuming \( p(e_1 + e_2) = k(e_1 + e_2) \) with \( k > 0 \). Salary is a fixed payment regardless of the outcome of group output, which does not elicit more effort from a self-interested agent absent the introduction of social preferences. However, the equity share can affect the individual’s optimal effort. The value of equity is \( y_i \tilde{V} \) for share \( y_i \).

Without loss of generality, we consider the problem from the perspective of worker \( i = 1 \). Given compensation structure \( x_1, x_2, y_1, y_2 \) and worker 2’s effort choice \( e_2 \), the problem faced by worker 1 is

$$\max_{e_1} \mathbb{E}u(e_1; e_2, x_1, x_2, y_1, y_2) = p(e_1 + e_2) \cdot u_{\text{Success}} + [1 - p(e_1 + e_2)] \cdot u_{\text{Failure}}$$

(1)

where

$$u_{\text{Success}} = x_1 + y_1 V - C(e_1) - (D_X + D_Y),$$

(2)

$$u_{\text{Failure}} = x_1 - C(e_1) - D_X.$$ 

(3)

\( D_X \) represents the worker’s inequality aversion in the salary domain and has the form

$$D_X = \alpha_x \left( \max\{(x_2 - C(e_2)) - (x_1 - C(e_1)), 0\} \right)$$

(4)

$$+ \beta_x \left( \max\{(x_1 - C(e_1)) - (x_2 - C(e_2)), 0\} \right).$$

(5)

\( \alpha_x \) is the degree of inequality aversion in salary when the worker is in a disadvantageous position, i.e., having lower utility than the other worker in the salary domain, and \( \beta_x \) denotes the degree of inequality aversion in salary when the worker is in an advantageous position, i.e., having higher utility than the other worker in the salary domain.

The variable \( D_Y \) represents the worker’s inequality aversion in the equity domain when
the group “succeeds” and takes the form

\[ D_Y = \alpha_y \left( \max \{ (y_2 - y_1)V, 0 \} \right) + \beta_y \left( \max \{ (y_1 - y_2)V, 0 \} \right). \] (6)

\( D_Y \) only appears when the group succeeds, as group output and value of equity is zero when the group fails. \( \alpha_y \) is interpreted as the degree of inequality aversion in equity when the worker is in a disadvantageous equity position, and \( \beta_y \) denotes the degree of inequality aversion in equity when the worker is in an advantageous equity position.

In the model, we assume all workers are self-interested, and thus are more inequality-averse when they are in the disadvantageous position than when they are in the advantageous position (\( \alpha_x > \beta_x, \alpha_y > \beta_y \)). We also assume that both disadvantageous and advantageous workers are averse to inequality, but only to an extent: the disutility caused by inequality cannot exceed the value of such inequality (1 > \( \alpha_x, \alpha_y, \beta_x, \beta_y > 0 \)). Finally, both disadvantageous and advantageous workers are more averse to inequality in equity than to inequality in salary (\( \alpha_y > \alpha_x, \beta_y > \beta_x \)).

## 2.2 Implications for the Worker

### 2.2.1 Domain-Contingent Inequality Aversion

Let the utility-maximizing effort of worker \( i \) be denoted by \( e_i^* \). Without loss of generality, we focus on \( e_1^* \). We first examine how the compensation package (salary and equity) of worker 1 and the package of the other worker affect worker 1’s equilibrium effort choice. These are standard results and are left to the Appendix (see Propositions A.1-A.3). Following Benjamin (2015), we derive our key results in Propositions 1-2 which predict how workers respond to inequality in equity under different model assumptions. In Proposition 3, we discuss how the perception of compensation scarcity may play a role in driving the domain-contingent inequality aversion and subsequently affect worker effort provision. All proofs are relegated to the Supplementary Appendix.
Proposition 1. Optimal Effort Response to Inequality in Equity Under Domain-Contingent Inequality Aversion. Let \( y_2 = y_0 \), then \( \lim_{y_1 \uparrow y_0} \frac{\partial e^*_1}{\partial y_1} > 1 \). Relative to equality in equity \( (y_1 = y_2 = y_0) \), effort responds more to equity cuts \( (y_1 < y_0) \) than to equity raises \( (y_1 > y_0) \).

Inequality in equity has a negative asymmetric effect on effort. A change in \( y_1 \) affects the choice of \( e^*_1 \), and the change in the choice of \( e^*_1 \) in turn may affect inequality aversion in the salary domain, causing \( e^*_1 \) to readjust. By the assumption that the employee is more inequality averse in the equity domain, we conclude the effect of equity must outweigh the effect of salary. Moreover, the assumption that the worker is self-interested suggests that disadvantageous equity positions (equity cuts) outweigh the effect of advantageous equity positions (equity raises), thus yielding Proposition 1. As we note in the proof of this Proposition, the negative asymmetric effect is stronger (i.e., \( \lim_{y_1 \uparrow y_0} \frac{\partial e^*_1}{\partial y_1} \) is larger) when \( \alpha_y \) or \( \beta_y \) is larger.

The negative asymmetric effect of inequality in equity, stated in Proposition 1, is a unique result of our domain-contingent inequality aversion model. In the next proposition, we compare this result with implications from a model with no inequality aversion (i.e., no inequality aversion terms at all in the utility function) and a model with non-domain-contingent inequality aversion (i.e., no separation of salary and equity payoff in the inequality aversion terms).

Proposition 2. Optimal Effort Response to Inequality in Equity Absent Domain-Contingent Inequality Aversion. Let \( y_2 = y_0 \). Let \( \tilde{e}_1 \) be worker 1’s optimal effort choice absent inequality aversion. Let \( \hat{e}_1 \) be worker 1’s optimal effort choice under non-domain-contingent inequality aversion. Then \( \lim_{y_1 \uparrow y_0} \frac{\partial \tilde{e}_1}{\partial y_1} = 1 \) and \( \lim_{y_1 \uparrow y_0} \frac{\partial \hat{e}_1}{\partial y_1} = 1 \). Relative to equality in equity \( (y_1 = y_2 = y_0) \), effort responds symmetrically to equity cuts \( (y_1 < y_0) \) and equity raises \( (y_1 > y_0) \).

In contrast to the prediction of the domain-contingent inequality aversion model, Proposition 2 says that models absent domain-contingent inequality aversion predict a symmetric
effect of inequality in equity on effort. Propositions 1 and 2 together suggest that the negative asymmetric effect of inequality in equity is uniquely derived from the domain-contingent inequality aversion assumption. Models without this assumption do not exhibit this effect. Therefore, we conclude that this negative asymmetric effect is a unique manifestation of domain-contingent inequality aversion. Since we hypothesize that workers have domain-contingent inequality aversion in equity and salary, we have the following hypothesis.

**Hypothesis 1. Domain-Contingent Inequality Aversion.** *There is a negative asymmetric effect of inequality in equity, i.e., workers respond more to equity cuts than to equity raises.*

We also derive additional results regarding how the employee responds to inequality in salary (see Proposition A.4) and how the worker’s response to inequality in salary relates to his response to inequality in equity (see Proposition A.5). These results are left to the Appendix.

### 2.2.2 Perceived Scarcity

Furthermore, we hypothesize that one mechanism for domain-contingent inequality aversion is a perceived scarcity of equity. In other words, workers dislike inequality in equity more than inequality in salary because equity is viewed as scarce. To formalize this hypothesis of perceived scarcity, we introduce a parameter $s$ into the model, which represents the perceived scarcity of equity relative to salary. We assume that $\alpha_y = \alpha_x (1 + s)$ and $\beta_y = \beta_x (1 + s)$, i.e., inequality aversion in the equity domain and inequality aversion in the salary domain only differ due to the perceived level of scarcity.\(^{11}\) The next proposition discusses the consequences for worker effort response as the perceived scarcity varies.

**Proposition 3. Optimal Effort Response to Inequality in Equity with Perceived Scarcity**

Let $y_2 = y_0$, then it is more likely that $\lim_{y_1 \downarrow y_0} \frac{\beta y_1}{\partial y_1} > 1$ when $s > 0$ than when $s \leq 0$.

Relative to equality in equity ($y_1 = y_2 = y_0$), it is more likely that effort responds more to
equity cuts ($y_1 < y_0$) than to equity raises ($y_1 > y_0$) when equity is perceived as more scarce than salary ($s > 0$).

When equity is perceived as more scarce than salary, inequality aversion in the equity domain is more severe than inequality aversion in the salary domain. As a result, we are more likely to observe the negative asymmetric effect of inequality in equity. When equity is perceived as less scarce than or equally scarce as salary, workers no longer experience more inequality aversion in the equity domain and we may not observe the negative asymmetric effect of inequality in equity. Therefore, we hypothesize that domain-contingent inequality aversion, tested through the existence of a negative asymmetric effect of inequality in equity, is more likely to appear when equity is perceived as a scarce reward.

**Hypothesis 2. Domain-Contingent Inequality Aversion Under Scarce Equity.** The negative asymmetric effect of inequality in equity is more likely to occur when equity is shown as a scarce reward.

### 2.3 Implications for the Firm

The propositions and hypotheses in Section 2.2 provide testable predictions for our laboratory experiment and also have implications for compensation decisions. Hypothesis 1 is particularly pertinent for a firm having a fixed employee equity pool, a situation faced by most firms issuing equity compensation. Firms that allocate a fixed total equity to employees devise a scheme to maximizes the total effort of their workers. According to Hypothesis 1, the negative asymmetric effect of inequality in equity on effort suggests that equitable distribution of equity is the optimal compensation strategy. The optimal strategy of salary compensation is less clear since firms may not set aside a fixed amount of cash for their employees. Yet, salary dispersion may be justified when inequality in salary has a positive asymmetric effect on effort under conditions specified in Proposition A.4. In the presence of a negative asymmetric effect of inequality in equity and a positive asymmetric effect of
inequality in salary, the *equality-in-equity* strategy (same equity but different salary) is the optimal strategy for firms.\textsuperscript{12} According to Hypothesis 2, such a negative asymmetric effect would more likely be present when equity is presented in its scarcity form which suggests our next hypothesis.

**Hypothesis 3. Total Group Effort.** *Equality in equity is more likely to induce the highest total group effort when equity is shown as a scarce reward.*

Moreover, while our model considers a two-worker case, the implications for equity compensation can be easily extended to any firm with a fixed employee equity pool. The case of companies consisting of two worker types of equal numbers is clearly a direct extension of the two-worker case. In fact, even when there are unequal numbers of multiple worker types, any deviation from general equality will lead to a reduction in total effort in the presence of a negative asymmetric effect of inequality in equity.\textsuperscript{13}

### 3 Experimental Design

We test our hypotheses using an experimental design borrowed from Charness and Kuhn (2007) and Kessler (2010), which enables us to impose a quadratic effort cost function and a linear production function to match the model specifications.

We recruited 960 workers from Amazon Mechanical Turk (MTurk) to participate in a 15-minute study via Qualtrics during October and November 2016. MTurk workers have become a useful sample in the study of worker effort and multi-person games (Chandler and Kapelner, 2013; Dreber et al., 2013; Rand et al., 2015; Jordan et al., 2016; Balasubramanian et al., 2017). In particular, many studies have shown there are no significant differences between the experimental results from MTurk and those derived from physical lab settings for various types of economic games (Horton et al., 2011; Suri and Watts, 2011; Amir et al., 2012). To ensure participants pay attention to experimental materials, we conducted comprehension checks at the beginning of the experiment after the participants read
the instructions. Each participant needed to correctly answer comprehension questions related to the instructions in order to proceed with the study. These questions were designed to make sure that participants understood the rules of the experiment and the factors affecting their earnings. When questions were answered incorrectly, participants were offered a new set of comprehension questions. Participants who failed three attempts were excluded from the study and were only paid their guaranteed payment. The comprehension checks screened out 186 participants, resulting in a sample size of 774 workers.

Participants were told this study investigated individual decision making and behavior. They were informed that they could earn bonus money in addition to their guaranteed payment ($0.25) based on their decisions in the study. The experiment had a within-subject design with each participant experiencing 7 scenarios (in a random order) of group production with different compensation schemes. In each scenario, a participant was paired with a random partner (new for each scenario), and each received a flat payment to mimic salary and a share of group output to mimic equity. Payoffs were denoted in experiment points with each point worth $0.001. Compensations for both people were public. Then, both participants had the opportunity to increase the probability of group success at a personal cost. Group output was $V = 500$ if the project succeeded but was zero if the project failed. Participants did not get any feedback during the 7 scenarios about the group outcome. In the end, one of the 7 scenarios was randomly selected to determine the final earnings of the participants. Compensation depended on decisions made by both participants in the group and the realization of group output. Basic demographic information including gender, education, race, and work experience was collected at the end of the experiment. Instructions were conveyed in a neutral language without mentioning concepts of effort, equity, salary, firm, or worker.

The experiment was further complemented by a between-subject design to test the specific mechanism that drives domain-contingent inequality aversion. There are two groups: control and scarcity treatment. The only difference between these two groups is the presentation of
the output share. To induce a perception of a “scarce” output share, we presented output share as a percentage instead of in experiment points. For example, while workers in the control group were presented with an offer of 250 experiment points as their share of a total group output of 500 points, workers in the scarcity treatment group were presented with the equivalent 50% of output share. In a real world context, these two presentations mirror the two ways that equity compensation can be presented to workers, grounding this design in an external valid fashion.

In principle, the description of the output share does not change the real value of the output share, but a percentage form facilitates the relative comparison of share size between participants (Dieckmann et al., 2009; Waters et al., 2006), and thus driving the salience of the finiteness of the 100% output. A fixed 100% means that there is a limited supply of output to be shared, and consequently increases the perception of scarcity. Limiting supply is a common intervention to induce perception of scarcity in experiments (Effron and Miller, 2011; Mittone and Savadori, 2009). To verify that equity is indeed perceived as more scarce when presented in percentage form, we conducted a validation survey based on seven-point Likert scale items with a separate pool of workers. Survey respondents were presented with the same group production game context and were asked to indicate how much they agree or disagree with the statement that “salary is scarce” and “equity is scarce.” We find that in the general equality scenario, workers in the treatment group (equity in percentage form) view equity as more scarce compared to workers in the control group (equity in experimental points) while the scarcity perception of salary does not appear to differ between the treatment and control groups.

Compensation levels are displayed in Table 1. There were three possible levels of flat payment (high, medium, low) and three possible levels of output share (high, medium, low). The control group comprised 387 workers, for which output share was presented in experiment points. 387 workers were in the scarcity treatment group, for which output share was presented in percentage form.
Table 2 summarizes the seven individual-level scenarios experienced by each participant (in a random order). We can collapse the individual-level scenarios into group-level conditions based on output share and flat payment equality/inequality. There are four group-level conditions in total: general equality, equality in share, equality in flat payment, and general inequality. We call a higher payoff in either flat payment or output share as an advantageous position and a lower payoff is designated a disadvantageous position. Each scenario is named first by the group-level condition, and then by the advantageous or disadvantageous position of the participant. Note that we set the value of inequality in share for a successful project, e.g., \((60\% - 40\%) \times 500 = 100\), equal to the inequality in flat payment, i.e., \(300 - 200 = 100\).

In each scenario, participants made a private decision to increase the probability of group project success at a personal cost. The cost schedule shown in Table 3 was identical for all participants across all scenarios. We refer to the number of points sacrificed to increase project success probability as one’s contribution. There are 5 possible contribution choices that increase quadratically for each increment in success probability. The square root of this privately stated level of contribution is interpreted as our measure of unobservable effort. Each unit of effort would increase the probability of success linearly by \(k = 4\%\). This type of stated effort measure is common in the experimental economics literature, especially studies on worker compensation and productivity in group production (Nalbantian and Schotter, 1997; Charness and Kuhn, 2007; Clark et al., 2010; Harbring and Irlenbusch, 2011). The advantage of our effort measure is that we could exactly impose a quadratic effort cost function and a linear production function in the experiment and directly test our predictions in Section 2. Based on the design parametrization, the optimal effort for a self-interested worker is 4, 5, or 6 when the output share is 40%, 50%, or 60% respectively. Our model
of inequality aversion suggests that actual worker effort choices should deviate from these values.

---

Insert Table 3

---

The average payment for participants was $0.47 with an average response time of 20.8 minutes and a median response time of 9.3 minutes. While the payment appears low, it is within the range for a typical MTurk job that lasts around 10-20 minutes.14 $0.25 is guaranteed and the rest of the payment depends on the actual decisions of both participants in a group based on a randomly selected scenario, which can range from $0.15 to $0.59.

4 Results

We first describe simple summary statistics of individual effort. We then report a regression analysis that tests our Hypothesis 1 regarding domain-contingent inequality aversion and evaluates Hypothesis 2 that perceived equity scarcity is the mechanism driving the domain-contingency. We conclude the section by providing suggestive evidence for Hypothesis 3 that offering the same equity but different salaries induces the highest total group effort only in presence of domain-contingent inequality aversion.

4.1 Summary Statistics of Individual Effort

Table 4 reports summary statistics for all individual-level scenarios. In both control and scarcity treatment groups, individual effort is higher in high payoff (“advantageous”) scenarios and lower in low payoff (“disadvantageous”) scenarios, relative to the general equality scenario. At the individual scenario level, the differences between the control group and the scarcity treatment group are not statistically significant, except for the general inequality (disadvantageous) scenario in which individuals in the scarcity treatment group provide less effort than those in the control group on average. According to Table 4, the average effort
choice under the general equality scenario is 5.45, suggesting that risk-aversion is unlikely a dominant factor in our experiment since a risk-averse agent would choose an effort level below 5 in this scenario absent any inequality.

--- Insert Table 4 ---

Figure 1 shows the distribution of individual effort choices under each scenario, pooling the control and the scarcity treatment groups. We group the 7 individual scenarios into 4 general group-level conditions: general equality, equality in share, equality in flat payment, and general inequality. The distributions tend to shift to the right for workers in the advantageous scenarios. Specifically, workers with both higher flat payment and higher output share than their partners (in the general inequality condition) exhibit the largest rightward shift. The rightward shift to higher effort choices also is slightly more prominent in the equality-in-share condition than in the equality-in-flat-payment condition. On the other hand, the distributions tend to shift to the left for workers in the disadvantageous scenarios. In particular, workers with both low flat payment and low output share than their partners (in the general inequality condition) exhibit the largest leftward shift. Comparing the equality-in-share condition and the equality-in-flat-payment condition, we see that fewer workers choose the lowest effort and more workers choose the highest effort when there is no inequality in share.

Another pattern from Figure 1 is that an effort choice of 5 appears to be the modal choice in the general equality condition and all the disadvantageous individual scenarios. A potential concern is that workers randomly pick an effort choice across 3 to 7 and in expectation would pick a choice of 5. We evaluate this concern by examining the mean effort choices reported in Table 4 and find that the mean effort choice is statistically significantly different from 5 for most scenarios ($p < 0.001$ for scenarios (a)-(d) and scenario (f), $p < 0.05$ for scenario (e)), except for scenario (g). Therefore, we do not believe that workers tend to choose an effort level of 5 as a result of randomizing over all effort choices. On the other hand, our model predicts that the optimal effort choice is 5 under the general equality scenario.
since workers should not experience inequality aversion. Some workers do choose other effort levels, with more people choosing levels above 5. We do not believe these non-optimal choices are due to inattentiveness since the change in mean effort choice under the general equality scenario is not statistically significant when we restrict the sample to workers with longer response time (10 minutes and above). A number of these most attentive workers still choose effort levels above 5, leading to a mean effort choice of 5.38 (statistically significantly different from 5 with $p < 0.001$). Two possible reasons for these high effort choices are pure altruism and risk-seeking behavior, especially when the financial stake in the experiment is relatively small. While some workers may exhibit these preferences, the two theories cannot generate the negative asymmetric effect of inequality in equity in Hypothesis 1 that is only predicted by the domain-contingent inequality aversion theory. In particular, risk-seeking preference suggests a positive asymmetric effect of inequality in equity, i.e., workers respond more to equity raises than to equity cuts.

--- Insert Figure 1 ---

Figure 2 shows the average individual effort choice by the grouped scenarios. In the equality-in-flat-payment condition (but inequality in share), workers in the disadvantaged position on average provide less effort than those in the disadvantaged position of the equality-in-share condition. Workers in the advantageous position on average provide less effort than those in the advantageous position of the equality-in-share condition, though not significantly so. The patterns provide some evidence that inequality in different domains can affect effort provision differently. Relative to the general equality condition, redistributing flat payment within the group while holding share equal appears to have a symmetric effect on effort.\textsuperscript{15} That is, higher flat payment increases effort by approximately the same amount that lower flat payment decreases effort. However, relative to the general equality condition, redistributing output share within the group while holding flat payment equal appears to have a negative asymmetric effect on effort.\textsuperscript{16} Lower share decreases effort more than the increase in effort from higher share.
We further examine how effort responds to different compensation schemes by collapsing the 7 individual scenarios based on the level of output share and flat payment respectively. Table 5 Panel A reports the summary statistics for all output share levels, and Panel B displays statistics for all flat payment levels. Suggestively, Panel A shows that effort on average responds to high and low output share almost symmetrically relative to medium level in the control group but responds to low output share more negatively in the treatment group. From Panel B, we see that effort appears to respond more negatively to low flat payment in the treatment group compared to the control group and, at the same time, responds more positively to high flat payment, though not significantly so for the latter. Before we formally test these patterns from the two panels and examine our hypotheses regarding inequality aversion in different domains, we notice that Panel B alone shows that workers clearly exhibit quite strong general inequality aversion consistent with the form predicted by Fehr and Schmidt (1999) since they respond heavily to inequality in flat payment, which is in contrast to the prediction of the neoclassical model that flat payment should not matter.

4.2 Individual Level Effort

First, we perform a full-sample regression analysis to test Hypothesis 1 that workers experience domain-contingent inequality aversion regarding equity and salary. We then conduct subsample analysis for the control group and the scarcity treatment group to test Hypothesis 2 that domain-contingent inequality aversion is driven by the perceived scarcity of equity. Table 6 reports regression results examining how different levels of compensation affect individual effort choice. According to Propositions 1 and 2, the domain-contingent inequality aversion model predicts a negative asymmetric effect of inequality in equity, or in other words, $\gamma_1 < |\gamma_3|$. In contrast, models with non-domain-contingent inequality aversion and no
inequality aversion predict a symmetric effect, i.e., $\gamma_1 = |\gamma_3|$. Consistent with the presence of domain-contingent inequality aversion, we find a negative asymmetric effect of inequality in equity. The estimated $\gamma_1$ is smaller than the absolute value of the estimated $\gamma_3$ (Columns (1)-(3)). In other words, workers respond more to low share than to high share. Such a negative asymmetric effect is statistically significant at the 10% level for the fixed effects specification in Column (3) ($p$-value of the F-test is 0.0649), and presents evidence for Hypothesis 1 that workers experience domain-contingent inequality aversion. We consider the fixed effects model as the ideal specification since it controls for time-invariant individual heterogeneity arising from inattentiveness, confusion, or shirking by dropping those individuals who do not change effort choices across scenarios.

Result 1. Consistent with the prediction of the domain-contingent inequality aversion model, inequality in equity has a negative asymmetric effect on effort, i.e., effort responds more to low share than to high share.

Furthermore, recall that we hypothesize that the domain-contingency is driven by perceived scarcity of equity. In particular, Hypothesis 2 says that domain-contingent inequality aversion is more likely to occur when equity is perceived as a scarce reward. Consequently, $\gamma_1 < |\gamma_3|$ is more likely to be observed for the treatment group when compared to the control group. In Table 6, we see that the negative asymmetric effect of inequality in equity becomes more prominent in the treatment subsample (Column (4)) with a $p$-value of 0.0593 for the F-test, but turns out to be statistically insignificant in the control subsample (Column (5)) with a $p$-value of 0.4559 for the F-test. We use the individual fixed effects specification for the subsample analysis to deal with potential inattentiveness of workers. Some workers do not change effort choices across scenarios so the specification using within-person variation is the ideal regression analysis. Hence, the test confirms Hypothesis 2 since the domain-contingency inequality aversion only appears in the treatment group for which equity is a scarce reward.
Result 2. We find that domain-contingent inequality aversion (i.e., more severe inequality aversion in the output share domain than in the flat payment domain) only appears when equity is presented in the scarcity format but does not appear when equity is presented in the same format as the flat payment.

We do not believe that worker attentiveness is a challenge to our results with the inclusion of attention checks in our design. Experimental evidence has shown that MTurk participants perform better on online attention checks than do subject pool participants (Hauser and Schwarz, 2016). To further deal with the concern that workers may stop paying attention after passing pre-screening questions, we restrict our main analysis in Table 6 to workers with response time greater than 5 minutes. This drops 8% of the sample, leaving us 713 workers. We find that our fixed effects regression is still robust and the negative asymmetric effect of inequality in equity is even stronger for the treatment subsample but not for the control subsample (p-value for the F-test is 0.0712 for the full sample, 0.0250 for the treatment subsample and 0.7034 for the control subsample).

Table 6 also provides results having implications regarding the parameter space for the degree of inequality aversion in the two separate domains. First, notice that the effect of inequality in flat payment appears to be positive asymmetric since high flat payment increases effort more than the drop in low flat payment ($\gamma_2 > |\gamma_4|$), though this asymmetric effect is marginally statistically significant at the 10% level ($p-$value from F-test of the null hypothesis that $\gamma_2 + \gamma_4 = 0$ is 0.1082). Second, relative to general equality, low share induces a larger decrease in effort than low flat payment ($|\gamma_3| > |\gamma_4|$) even when the share reduction is at most equal to that of the flat payment reduction. The difference is statistically significant at the 1% level ($p-$value from F-test of the null hypothesis that $\gamma_3 = \gamma_4$ is 0.0036). Third, we see that effort responds less to an increase in share than to an increase in flat payment ($\gamma_1 < \gamma_2$), though not significantly so ($p-$value from F-test of the null hypothesis that $\gamma_1 = \gamma_2$ is 0.4222). According to Propositions A.4 and A.5, given the model assumption of domain-contingent inequality aversion, these results imply that $\alpha_x - \beta_x \leq 2\alpha_x\beta_x$. 

22
4.3 Group Level Effort

Examining the group level outcomes, we test Hypothesis 3 that equality in equity is more likely to induce the highest total group effort when equity is shown as a scarce reward. In other words, offering the same equity but different salaries is more likely the optimal firm compensation strategy when equity is perceived as more scarce.

Figure 3 illustrates the average total group effort across conditions. While average total group effort is the highest under the equality-in-share condition for the treatment group, group effort is lower than the average total group effort under other conditions (general equality and general inequality) for the control group. This finding, though not statistically significant, is consistent with Hypothesis 3 that equality-in-share is more likely the optimal compensation strategy (in the sense of inducing the highest total group effort) when share is shown as a scarce reward in percentage form. A regression analysis further supports this conclusion. Table 7 reports regression results examining how total group effort is affected by different group-level conditions. We find that total group effort is higher under the equality-in-share condition relative to the equality-in-flat-payment condition (Column (1)), and more so when we restrict to the scarcity treatment subsample. While we do not have enough statistical significance for our estimates, the signs suggest that the equality-in-share condition induces higher total effort than all the other conditions only in the scarcity treatment sample (i.e., when share is shown in the percentage form).

These suggestive findings are consistent with the implications from our experimental results in the previous section. Domain-contingent inequality aversion implies that inequality in output share has a negative asymmetric effect on effort while inequality in flat payment can have a positive asymmetric effect on effort. As a result, the equality-in-share condition (but inequality in flat payment) is more likely to induce the highest total group effort when
domain-contingent inequality aversion is more prominent, i.e., in the treatment group when equity is presented as a more scarce reward relative to the control group.

5 Conclusion

We propose a behavioral model of domain-contingent inequality aversion and argue that workers dislike inequality in the equity domain more than salary inequality because of the perceived scarcity of equity. In contrast to other models with non-domain-contingent inequality aversion or no inequality aversion, our model features a negative asymmetric effect of inequality in equity. This negative asymmetric effect, coupled with a possible positive asymmetric effect of inequality in salary, suggests that the equality-in-equity compensation strategy could benefit firms. In an experiment, we examine how workers respond to combinations of different distributions of equity and salary. Our findings produce corroborating evidence for the existence of domain-contingent inequality aversion, and further demonstrate that such domain-contingency is largely driven by a perception of equity scarcity.

While our findings are interesting during a time when firms are increasingly using incentives other than traditional salaries, we are aware of the limitations. The character of workplace interactions can be far more complex than what is presumed in our experimental setting, and consideration of real-effort contribution may not be perfectly proxied by stated effort. These are valid points, but we do not feel that they reduce the significance of the fundamental concepts we uncover. Our intent in the experiment is to shed light on the underlying layers of inequality aversion and the factors that influence behavior under combinations of different incentives.

Furthermore, we consider a number of competing stories about worker preferences in our setting and find evidence that rules them out. While some workers may exhibit pure altruism or risk-seeking behavior to some extent, our observed negative asymmetric effect of inequality in equity characterizing domain-contingent inequality aversion cannot be explained by these
two preferences. Moreover, even though risk-averse workers may potentially produce the aforementioned negative asymmetric effect, our summary statistics show that risk-aversion is not a dominant factor as workers tend to choose effort levels above what is predicted by risk-aversion.

Our experimental design enables us to focus on the proposed mechanism of perceived scarcity of equity. The design screens out many alternative mechanisms, such as a failure to recognize the importance of equity (since most employees do not understand the value of the options they hold), differential bargaining power over equity versus salary, distinct information structures (salary information is likely confidential while equity information is likely public knowledge), and overoptimism about the equity value (Bergman and Jenter, 2007; Oyer and Schaefer, 2005) since both equity and salary are essential, non-negotiable, public, and bounded in our design. Our results, however, do not rule out two other potential mechanisms for why equity and salary occupy separate domains. Perhaps equity differs from salary because of its non-pecuniary benefits, such as a sense of ownership and legitimacy of status (Graham et al., 2002; Hamilton, 2000). Also, equity likely might be viewed as a current asset while cash might just be viewed as current income, in which case cash and equity are in different mental accounts that interact differently with individual inequality aversion (Shefrin and Thaler, 1988). These alternatives would complement the view of domain-contingent inequality aversion.

Human capital is the most critical asset of modern technology and service firms. Compensation structures incentivize performance and facilitate the hiring and retention of skilled employees and managers. The finding that workers respond to inequality differently depending on the domain of compensation, especially the domain associated with scarcity such as equity, provides implications for compensation package design in organizations. Unequal allocation of scarce rewards may not be a good incentive since it can reduce total worker effort.
In the technology setting, compensation comparisons are less commonly drawn between recently hired employees and early employees, and even less so between late employees and founders and investors, who receive substantial equity shares in the firm. Social comparisons are strongest among members of an in-group with a shared group identify (Chen and Li, 2009), and the in-group in this setting is the employees of a similar hiring cohort. Workers also exhibit baseline social preferences towards their employers consistent with theories of warm glow and social norms (DellaVigna et al., 2016), which suggests that recently hired employees would be more tolerant of the large equity shares of the founders and investors who serve as the de facto employer.

Based upon compensation packages offered by firms in 2015 on AngelList, a popular online job-posting site for technology firms.

Rachel Sugar, “A CEO raised his company’s minimum wage to $70,000 a year, and some employees quit because of it,” Business Insider, July 31, 2015.

“Domain” typically refers to the context of decision-making when it appears in the discussion of context-dependent risk preferences (Bonem et al., 2015; Weber et al., 2002) and social preferences (Bao and Ho, 2015; De Oliveira et al., 2009). Furthermore, Schoemaker (1990) uses the phrase “payoff domain” to distinguish gains from losses in monetary outcomes. In our theory, “domain” refers to the payoff form, and more specifically equity versus salary, which can be a particular context for social preference to take place.

The creation and issuing of additional options beyond the existing options pool are costly to prior employees because the new options dilute their percentage ownership of the firm.


In contrast to Nalbantian and Schotter (1997), we adopt a stochastic form involving a binary output that simplifies the model. Moreover, this setup links better with the treatments in our empirical experiment by allowing us to present the subjects with a fixed number of experimental points in the case of group success to keep treatments equivalent.

Risk neutrality is an appropriate simplifying assumption for deriving predictions to be tested in a laboratory setting since people are approximately risk neutral when stakes are small (as is in the lab) according to the expected-utility theory.

We choose this specification for model tractability and also for a convex cost function.

We choose this linear specification for model tractability.

Adding this perceived scarcity parameter does not change the equilibrium results we derive in Propositions A.1-A.5 (the threshold in Proposition A.2 may vary depending on the sign of s). We can also assume
that $\alpha_y = \alpha_x(1 + s_\alpha)$ and $\beta_y = \beta_x(1 + s_\beta)$ to allow the perceived scarcity parameter to differ based on advantageous or disadvantageous position. Our model results remain the same as long as $s_\alpha$ and $s_\beta$ have the same sign.

The current version of this paper focuses on predictions for workers’ effort choices since our lab experiment only examines responses to predetermined compensation packages. In future work, we plan to derive equilibrium results by solving the firm’s problem rigorously as in Benjamin (2015).

Suppose there are $T$ types of workers. $a_t$ is the number of workers of type $t$, $t = 1, 2, \ldots, T$. Suppose the equity pool for workers is fixed. Under equality in equity, each worker receives equity share of the total pool $y = \frac{100}{\sum_{t=1}^{T} a_t}$. Let $e$ be the optimal effort provided by each worker when everyone receives $y$. Under inequality in equity, suppose there are $S$ types of workers getting less than $y$, then there are $T - S$ types of workers getting more than or equal to $y$ with at least one type of workers getting more than $y$. Without loss of generality, let $t = 1, \ldots, S$ be the types of workers getting less than $y$. Let $y_t$ be the equity share of the total pool received by a type $t$ worker and let $e_t$ be the optimal effort provided by this type of worker. Since the equity pool is fixed, we have $\sum_{t=1}^{S} a_t y_t + \sum_{t=S+1}^{T} a_t y_t = 100 = y \sum_{t=1}^{T} a_t$, thus yielding $\sum_{t=1}^{S} a_t (y_t - y) = \sum_{t=S+1}^{T} a_t (y - y_t)$. In the presence of negative asymmetric effect of equality in equity, we have $\frac{\text{total increase in effort}}{\text{total decrease in effort}} = \frac{\sum_{t=1}^{S} a_t (e_t - e)}{\sum_{t=S+1}^{T} a_t (e - e_t)} < \frac{\sum_{t=1}^{S} a_t (y_t - y)}{\sum_{t=S+1}^{T} a_t (y - y_t)} = 1$, so there is a reduction in total effort.

Based on the study of Society for Industrial and Organizational Psychology, $0.75$ is a reasonable rate for a 30-minute survey (Link: http://www.siop.org/tip/oct11/03barger.aspx). This means the reasonable rate is $0.25$-$0.50$ for a job that lasts around 10-20 minutes.

Running a regression of effort on all scenario indicators and controlling for individual fixed effects, we find that the changes in the two scenarios under the equality in share condition relative to the general equality condition is not statistically significantly different from each other (F-test gives a $p$-value of 0.7916).

Running a regression of effort on all scenario indicators and controlling for individual fixed effects, we find that the changes in the two scenarios under the equality in flat payment condition relative to the general equality condition is statistically significantly different from each other (F-test gives a $p$-value of 0.0141).

The value of share reduction is at most $(60\% - 50\%) \times 500 = 50$. The value of flat payment reduction is $300 - 250 = 50$.

References


Figure 1: **Distributions of Individual Effort Choice by Scenario.** This figure shows the distribution of individual effort choices under each scenario, pooling the control and the scarcity treatment groups. The 7 individual-level scenarios are organized into 4 general group-level conditions in 4 subfigures: general equality (top left), equality in share (top right), equality in flat payment (bottom left), and general inequality (bottom right). The x-axis represents individual effort choice. Note that effort choice is converted from individual contribution to the group and ranges from 3 to 7. The y-axis and the histograms represent the fractions of each effort choice within the condition. In the equality-in-share condition, equality-in-flat-payment condition, and general inequality condition, there are two types of scenarios: advantageous (white bars with black outlines) and disadvantageous (light grey bars). In the equality-in-share condition, advantageous refers to the scenario with high flat payment; disadvantageous denotes the scenario with low flat payment. In the equality-in-flat-payment condition, advantageous scenario signifies the scenario with high output share while disadvantageous scenario refers to the scenario with low output share. In the general inequality condition, advantageous scenario refers to the scenario with both high flat payment and high output share while disadvantageous scenario signifies the scenario with both low flat payment and low output share.
Figure 2: **Average Individual Effort Choice by Scenario.** This figure shows the average individual effort choice by scenarios, pooling the control and the scarcity treatment groups. The 7 individual-level scenarios are organized into 4 general group-level conditions in 4 bars: general equality (first bar), equality in share (second bar), equality in flat payment (third bar), and general inequality (fourth bar). The x-axis represents the condition. The y-axis represents the average individual effort. Error bars are displayed in black, representing 95% confidence intervals. In the equality-in-share condition, equality-in-flat-payment condition, and general inequality condition, there are two overlaid bars that represent two types of scenarios: advantageous (white bars with black outlines) and disadvantageous (light grey bars). In the equality-in-share condition, advantageous scenario refers to the scenario with high flat payment while disadvantageous scenario denotes the scenario with low flat payment. In the equality-in-flat-payment condition, advantageous scenario refers to the scenario with high output share while disadvantageous scenario signifies the scenario with low output share. In the general inequality condition, advantageous scenario refers to the scenario with both high flat payment and high output share while disadvantageous scenario denotes the scenario with both low flat payment and low output share.
Figure 3: **Average Total Group Effort by Condition.** This figure shows the average total group effort across conditions for the control and scarcity treatment groups respectively, in support of Hypothesis 3. There are 4 general group-level conditions: general equality, equality in share, equality in flat payment, and general inequality. The x-axis represents the group-level conditions. The y-axis and the bars represent the average total group effort. The control group averages are in dark grey and the scarcity treatment group averages are in light grey. Error bars are displayed, representing 95% confidence intervals. The black dashed horizontal line is added to compare the equality-in-share condition with other conditions for the control group. The grey dotted horizontal line is added to compare the equality-in-share condition with other conditions for the scarcity treatment group.
Table 1: **Levels of Compensation.** This table displays the possible levels of flat payment and output share. There are three possible levels for either flat payment or output share: high, medium, and low. Flat payment is shown in experiment points. Output share is presented in different formats depending on the group. In the control group, output share if the project succeeds is shown in experiment points. In the scarcity treatment group, output share is shown in percentage. Note that the total group output is 500 points if the project succeeds, so the value of output share is the same in both control and scarcity treatment groups.

<table>
<thead>
<tr>
<th>Level</th>
<th>Flat Payment</th>
<th>Control (Points)</th>
<th>Scarcity Treatment (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>300</td>
<td>300</td>
<td>60%</td>
</tr>
<tr>
<td>Medium</td>
<td>250</td>
<td>250</td>
<td>50%</td>
</tr>
<tr>
<td>Low</td>
<td>200</td>
<td>200</td>
<td>40%</td>
</tr>
</tbody>
</table>
Table 2: **All Individual-Level Scenarios.** This table shows the 7 individual-level scenarios. First column provides the names of scenarios. Each scenario is named first by the group-level condition (general equality, equality in share, equality in flat payment, general inequality) and then named by the advantageous or disadvantageous position. Second and third columns show the amount of flat payment (in experiment points) received by the participant and his partner respectively given the scenario. Fourth and fifth columns show the amount of output share received by the participant and his partner respectively given the scenario. Note that output share is shown in percentage form for the scarcity treatment group and is shown in experiment points for the control group.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Flat Payment</th>
<th>Output Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) General Equality</td>
<td>Participant</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>His Partner</td>
<td>250</td>
</tr>
<tr>
<td>(b) Equality in Share (Advantageous)</td>
<td>Participant</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>His Partner</td>
<td>200</td>
</tr>
<tr>
<td>(c) Equality in Share (Disadvantageous)</td>
<td>Participant</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>His Partner</td>
<td>300</td>
</tr>
<tr>
<td>(d) Equality in Flat Payment (Advantageous)</td>
<td>Participant</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>His Partner</td>
<td>250</td>
</tr>
<tr>
<td>(e) Equality in Flat Payment (Disadvantageous)</td>
<td>Participant</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>His Partner</td>
<td>250</td>
</tr>
<tr>
<td>(f) General Inequality (Advantageous)</td>
<td>Participant</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>His Partner</td>
<td>200</td>
</tr>
<tr>
<td>(g) General Inequality (Disadvantageous)</td>
<td>Participant</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>His Partner</td>
<td>300</td>
</tr>
</tbody>
</table>

Table 3: **Cost Schedule for Increasing Probability of Group Project Success.** This table shows the cost schedule for increasing probability of group project success. Probability of success can be increased linearly at a 4% interval. We refer to the number of points sacrificed to increase project success probability as one’s contribution. There are 5 possible levels of contribution, increasing quadratically. The square root of this privately stated level of contribution is interpreted as our measure of unobservable effort.

<table>
<thead>
<tr>
<th>Increased Probability of Success</th>
<th>12%</th>
<th>16%</th>
<th>20%</th>
<th>24%</th>
<th>28%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of Points (Contribution, Seen)</td>
<td>9</td>
<td>16</td>
<td>25</td>
<td>36</td>
<td>49</td>
</tr>
<tr>
<td>Effort Choice (√Contribution, Unseen)</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
Table 4: **Summary Statistics: Means of Individual Effort Choice by Scenario.** This table reports the summary statistics for individual effort choice by individual-level scenario. The first column lists all the scenarios. The second and third columns report the means of individual effort and standard errors (in parentheses) for the control group and the scarcity treatment group respectively. The fourth column shows the full sample averages and standard errors (in parentheses). The last column reports the \( p \)-values from two-tailed \( t \)-tests between the control group and the treatment group (*\( p < 0.10 \), **\( p < 0.05 \), ***\( p < 0.01 \)).

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Control</th>
<th>Treatment</th>
<th>Total</th>
<th>( p )-Value</th>
<th>(Control vs. Treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) General Equality</td>
<td>5.47</td>
<td>5.42</td>
<td>5.45</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.059)</td>
<td>(0.062)</td>
<td>(0.043)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Equality in Share (Adv)</td>
<td>5.64</td>
<td>5.70</td>
<td>5.67</td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.060)</td>
<td>(0.066)</td>
<td>(0.044)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Equality in Share (Dis)</td>
<td>5.22</td>
<td>5.19</td>
<td>5.21</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.062)</td>
<td>(0.065)</td>
<td>(0.045)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Equality in Flat Pay (A)</td>
<td>5.65</td>
<td>5.63</td>
<td>5.64</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.061)</td>
<td>(0.064)</td>
<td>(0.044)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) Equality in Flat Pay (D)</td>
<td>5.10</td>
<td>5.10</td>
<td>5.10</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.063)</td>
<td>(0.067)</td>
<td>(0.046)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) General Inequality (A)</td>
<td>5.80</td>
<td>5.87</td>
<td>5.84</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.061)</td>
<td>(0.064)</td>
<td>(0.044)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) General Inequality (D)</td>
<td>5.12</td>
<td>4.92</td>
<td>5.02</td>
<td>0.04**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
<td>(0.066)</td>
<td>(0.047)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>387</td>
<td>387</td>
<td>774</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5: **Summary Statistics: Means of Individual Effort Choice by Compensation Level.** This table reports the summary statistics for individual effort choice by compensation level. In Panel A, each scenario is categorized based on the level of output share (high, medium, low). In Panel B, each scenario is categorized based on the level of flat payment (high, medium, low). Note that for both Panels A and B, there are 774 observations for high and low levels per group (control or treatment), and 1,161 observations for medium levels per group (control or treatment). For both panels, the first column lists the compensation level, the second and third columns report the means of individual effort and standard errors (in parentheses) for the control group and the scarcity treatment group respectively, the fourth column shows the full sample averages and standard errors (in parentheses), and the last column reports the p-values from two-tailed t-tests between the control group and the treatment group (*p < 0.10, **p < 0.05, ***p < 0.01).

<table>
<thead>
<tr>
<th>Level</th>
<th>Group</th>
<th></th>
<th></th>
<th>p-Value (Control vs. Treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Treatment</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Panel A: Levels of Output Share</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>5.73</td>
<td>5.75</td>
<td>5.74</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td>(0.043)</td>
<td>(0.046)</td>
<td>(0.031)</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>5.45</td>
<td>5.44</td>
<td>5.44</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td>(0.038)</td>
<td>(0.026)</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>5.11</td>
<td>5.01</td>
<td>5.06</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
<td>(0.047)</td>
<td>(0.033)</td>
<td></td>
</tr>
<tr>
<td>Panel B: Levels of Flat Payment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>5.72</td>
<td>5.78</td>
<td>5.75</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>(0.043)</td>
<td>(0.046)</td>
<td>(0.031)</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>5.41</td>
<td>5.38</td>
<td>5.40</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>(0.036)</td>
<td>(0.038)</td>
<td>(0.026)</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>5.17</td>
<td>5.06</td>
<td>5.11</td>
<td>0.092*</td>
</tr>
<tr>
<td></td>
<td>(0.045)</td>
<td>(0.047)</td>
<td>(0.033)</td>
<td></td>
</tr>
</tbody>
</table>
Table 6: **Regression Results for Individual Effort.** This table shows the regression results for individual effort, in support of Hypothesis 1 and Hypothesis 2. The dependent variable is individual effort. The independent variables include the indicators for each output share level (high, medium, low) and for each flat payment level (high, medium, low). Medium share and medium flat payment indicators are dropped as reference categories. Columns (1)-(3) report the estimates using the full sample. Column (1) shows the estimates for the main regression specification. Column (2) shows the estimates when additional individual controls are included. The individual controls include gender, education, race, and whether the person has working experience or not. Column (3) shows the estimates when individual fixed effects are added. Column (4) shows the estimates for the scarcity treatment group. Column (5) shows the estimates for the control group. Robust standard errors are reported in parentheses, and are clustered at the individual level in the fixed effects regression (Column 3). *p-values from the F-tests on $\gamma_1 = |\gamma_3|$ are reported.

$^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

<table>
<thead>
<tr>
<th>Dependent Variable: Individual Effort</th>
<th>Full Sample</th>
<th>Subsamples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS (1)</td>
<td>OLS (2)</td>
</tr>
<tr>
<td>High Share ($\gamma_1$)</td>
<td>0.202***</td>
<td>0.202***</td>
</tr>
<tr>
<td></td>
<td>(0.043)</td>
<td>(0.042)</td>
</tr>
<tr>
<td>High Flat Payment ($\gamma_2$)</td>
<td>0.233***</td>
<td>0.233***</td>
</tr>
<tr>
<td></td>
<td>(0.043)</td>
<td>(0.042)</td>
</tr>
<tr>
<td>Low Share ($\gamma_3$)</td>
<td>-0.276***</td>
<td>-0.275***</td>
</tr>
<tr>
<td></td>
<td>(0.044)</td>
<td>(0.044)</td>
</tr>
<tr>
<td>Low Flat Payment ($\gamma_4$)</td>
<td>-0.169***</td>
<td>-0.170***</td>
</tr>
<tr>
<td></td>
<td>(0.044)</td>
<td>(0.043)</td>
</tr>
<tr>
<td>Constant</td>
<td>5.420***</td>
<td>4.231***</td>
</tr>
<tr>
<td></td>
<td>(0.034)</td>
<td>(0.211)</td>
</tr>
<tr>
<td>F-test p-value ($\gamma_1 =</td>
<td>\gamma_3</td>
<td>$)</td>
</tr>
<tr>
<td>Individual Controls</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Individual Fixed Effects</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
<td>5,418</td>
<td>5,411</td>
</tr>
</tbody>
</table>
Table 7: Regression Results for Total Group Effort. This table shows the regression results for total group effort, in support of Hypothesis 3. The dependent variable is total group effort. The independent variables include the indicators for all group-level conditions: general equality, equality in share, equality in flat payment, and general inequality. The reference condition is equality-in-share (but inequality in flat payment) and is hence dropped. Column (1) reports the estimates using the full sample. Column (2) shows the estimates for the scarcity treatment group. Column (3) shows the estimates for the control group. Robust standard errors are reported in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Total Group Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full Sample</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>General Equality ($\delta_1$)</td>
<td>0.062</td>
</tr>
<tr>
<td></td>
<td>(0.107)</td>
</tr>
<tr>
<td>Equality in Flat Payment ($\delta_2$)</td>
<td>-0.178**</td>
</tr>
<tr>
<td></td>
<td>(0.089)</td>
</tr>
<tr>
<td>General Inequality ($\delta_3$)</td>
<td>-0.013</td>
</tr>
<tr>
<td></td>
<td>(0.090)</td>
</tr>
<tr>
<td>Constant</td>
<td>10.865***</td>
</tr>
<tr>
<td></td>
<td>(0.063)</td>
</tr>
<tr>
<td>Observations</td>
<td>2,696</td>
</tr>
</tbody>
</table>
A Appendix: Additional Propositions

All proofs are relegated to the Supplementary Appendix.

A.1 Proposition A.1

Proposition A.1. \( e_1^* \) is nondecreasing in \( x_1 \) and is nonincreasing in \( x_2 \).

Proposition A.1 says that higher salary cannot reduce a worker’s effort, and can only increase it or have no impact. On the other hand, higher salary of one’s coworker cannot increase one’s effort, and can only decrease it or have not impact. These patterns are hinged on inequality aversion in the salary domain.

A.2 Proposition A.2

Proposition A.2. Let \( \Delta y_1 > 0 \) be the change in \( y_1 \), then \( e_1^* \) is increasing in \( y_1 \) if \( \frac{\Delta y_1}{y_1} > \frac{\alpha_x + \beta_x}{(1-\beta_x)(1-\beta_y)} \).

Increasing a worker’s equity may not necessarily increase his effort but is guaranteed to increase his effort when the equity change is large enough. Proposition A.2 gives a sufficient but not necessary condition. It is possible for a sufficiently small increase in equity to decrease effort. Since \( \frac{\alpha_x + \beta_x}{(1-\beta_x)(1-\beta_y)} \) is increasing in \( \alpha_x \) and \( \beta_x \), the equity change is more likely to be large enough when the degree of inequality aversion in the salary domain is small.

A.3 Proposition A.3

Proposition A.3. Let \( \Delta y_2 > 0 \) be the change in \( y_2 \), then

(a) \( \exists \delta > 0 \) such that \( e_1^* \) is decreasing in \( y_2 \) if \( \Delta y_2 \in (\delta, +\infty) \);

(b) \( \exists \delta' > 0 \) and \( \delta'' > 0 \) such that \( e_1^* \) is increasing in \( y_2 \) if \( y_2 < y_1 \) and \( \Delta y_2 \in (\delta', \delta'') \).
Proposition A.3(a) states that a raise in the coworker’s equity reduces the worker’s own effort when the raise is big enough. But according to Proposition A.3(b), a raise in the coworker’s equity may increase the worker’s effort if the worker is in a position with relatively high equity and the coworker’s raise is not too big. When a big raise in coworker’s equity exacerbates inequality in equity, the worker responds unfavorably due to inequality aversion. On the other hand, if the equity raise in the coworker’s pay mitigates inequality in equity, the worker may respond favorably by providing more effort.

A.4 Proposition A.4

**Proposition A.4.** Let \( x_2 = x_0 \), and let \( e_1^* = e_1^0 \) when \( x_1 = x_2 \). Then,

(a) \( \lim_{x_1 \uparrow x_0} |e_1^* - e_1^0| \geq \lim_{x_1 \downarrow x_0} |e_1^* - e_1^0| \)

(i) if \( y_2 > y_1 \); or

(ii) if \( y_2 = y_1 \) and \( \alpha_x - \beta_x \geq 2\alpha_x \beta_x \).

(b) \( \lim_{x_1 \uparrow x_0} |e_1^* - e_1^0| \leq \lim_{x_1 \downarrow x_0} |e_1^* - e_1^0| \)

(i) if \( y_2 < y_1 \); or

(ii) if \( y_2 = y_1 \) and \( \alpha_x - \beta_x \leq 2\alpha_x \beta_x \).

The equalities hold when \( \lim_{x_1 \uparrow x_0} e_1^* = \lim_{x_1 \downarrow x_0} e_1^* = e_1^0 \).

Relative to equality in salary (\( x_1 = x_2 = x_0 \)), when a worker’s effort responds more to salary raises (\( x_1 > x_0 \)) than to salary cuts (\( x_1 < x_0 \)), we say that inequality in salary has a **positive asymmetric effect** on effort. If the reverse is true, we say that inequality in salary has a **negative asymmetric effect** on effort. The effect is **symmetric** if a worker’s effort responds to salary cuts and raises in the same magnitude. Unlike the negative asymmetric effect in the equity domain, Proposition A.4 suggests that the results on the effect of unequal salary are mixed. According to Part (i) of Proposition A.4(a), inequality in salary has either a
symmetric or negative asymmetric effect on worker 1’s effort when worker 1 has less equity than worker 2. When worker 1 has more equity than worker 2, Part (i) of Proposition A.4(b) says that inequality in salary has either a symmetric or positive asymmetric effect. Part (ii) of Propositions A.4(a) and A.4(b) state that when workers have the same equity, the relationship between advantageous and disadvantageous inequality aversion in the salary domain \((\alpha_x, \beta_x)\) determines whether there is a positive or negative asymmetric effect. Finally, if \(e_1^*\) remains unchanged regardless of equity cuts or raises, then it is trivially true that the effect of inequality in salary is symmetric.

A.5 Proposition A.5

Proposition A.5. Let \(x_2 = x_0, y_2 = y_0\), and let \(e_1^* = e_1^0\) when \(x_1 = x_2\) and \(y_1 = y_2\). Then,
\[
\lim_{y_1 \uparrow y_0} \frac{|e_1^* - e_1^0|}{|e_1^* - e_1^0|} \geq 1 \iff \alpha_x - \beta_x \leq 2\alpha_x \beta_x \iff \lim_{x_1 \downarrow x_0} \frac{|e_1^* - e_1^0|}{|e_1^* - e_1^0|} \leq 1.
\]

According to Proposition A.5, relative to general equality \((x_1 = x_2 = x_0, y_1 = y_2 = y_0)\), effort responds more to equity cuts \((y_1 < y_0)\) than to salary cuts \((x_1 < x_0)\) if and only if effort responds more to salary raises \((x_1 > x_0)\) than to equity raises \((y_1 > y_0)\).
B Appendix: Laboratory Experiment

B.1 Experimental Procedures

Figure B.1 lays out the experimental procedure. Detailed experimental instructions for the control group and the treatment group are available in the Supplementary Appendix.

Figure B.1: Experimental Procedures.