Two-Dimensional Dictator Game: The Superficial 50–50 Norm*

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Abstract

Recent studies on dictator game experiments have shown that individuals often share monetary resources out of concern for social image, particularly the desire to avoid being perceived as unfair. Consequently, the behavioral norm of splitting resources equally—the *50:50 norm*—has been widely observed, even with anonymous partners.

This study provides experimental evidence for an alternative form of the 50:50 norm. We design a two-dimensional dictator game in which subjects allocate both a desirable resource (money) and an undesirable burden (a simple task). The task is deliberately designed to be short and easy, while being clearly less valuable than money. Using this setup, we identify what we call a *superficial 50:50 norm*: when allocating heterogeneous resources, individuals tend to disregard qualitative differences and instead choose allocations that simply average to 50% across dimensions.

Crucially, this norm is not a mere multi-dimensional generalization of the conventional one. Whereas the conventional 50:50 norm emerges when plausible deniability is unavailable, the superficial 50:50 norm itself serves as a form of plausible deniability: by averaging money and task at 50%, individuals preserve their social image while appropriating a larger share of the more valuable monetary resource.

Keywords: dictator game; fairness norm; social image; heterogeneous resource allocation, superficial 50:50 norm

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1. Introduction

Many people may be familiar with situations in which colleagues or friends accept minor inconveniences in exchange for claiming more favorable or rewarding outcomes. For the decision-maker, receiving one favorable item in return for accepting one unfavorable item may seem equitable; however, it often leaves the counterpart feeling uneasy. This unease likely stems from a perceived imbalance in the underlying value of the two items.

We suspect that when a single individual is given the authority to allocate two qualitatively different resources—such as rewards and burdens—this may give rise to what we call the *superficial 50:50 norm*: allocations that appear fair in form but fail to reflect actual differences in value. To investigate this possibility and the underlying mechanism, we implement a two-dimensional dictator game in which subjects allocate both a desirable resource (money) and an undesirable burden (a simple task). The task is deliberately designed to be short and easy, while being clearly less valuable than money.

2. Related Literature

Recent dictator game studies suggest that allocations to others are not necessarily driven by altruism (e.g., List, 2007), but by concerns for social image. Andreoni and Bernheim (2009) show that the 50:50 norm emerges when dictators lack plausible deniability; in such cases, individuals divide resources equally to avoid appearing unfair. This highlights the role of image concerns in promoting equal sharing. Building on this, our study shows that when dictators allocate two qualitatively different resources, they often choose allocations where the simple average of the two rates equals 50%. In doing so, they preserve social image while appropriating a larger share of the more valuable resource, money. This mechanism is what we call *the superficial 50:50 norm.*

Our approach also connects to List (2007), who emphasized that institutional design fundamentally shapes dictator behavior. By extending the dictator game to two dimensions—money and task—we also examine how the authority to allocate these two resources should be distributed to promote fairer choices.

3. Theory and Hypotheses

Andreoni and Bernheim (2009) analyze a signaling game in which dictators use the amount they allocate to the recipient to signal that they are a fair type, based on the following utility function that incorporates concerns for social image: $u(x^m, m(x^m)|t) = F\big(1 - x^m, m(x^m)\big) + tG(x^m - 1/2)$. Here, x^m denotes the share of money allocated to the recipient, $m(x^m)$ represents the social image as perceived by observers, and t is a type-parameter that captures the strength of inequality aversion. They show that, in equilibria satisfying the D1 criterion, dictators are more likely to choose a 50:50 allocation when plausible deniability is unavailable.

We postulate the following two behavioral assumptions and generalize the above utility function to accommodate allocation decisions involving two qualitatively different resources—money and task.

A1: Individuals evaluate inequality based on the simple average of allocation rates across dimensions, $\bar{x}$ rather than considering each resource separately.

A2: The degree of inequality aversion, denoted by t, increases with the number of allocation dimensions n.

The former assumption states that, even when resources differ in kind (e.g., money and task), individuals assess fairness based on the arithmetic mean of allocation rates, without regard to qualitative differences. The latter implies that allocating multiple resources in a self-serving manner entails greater psychological cost from perceived inequality than doing so with a single resource.

To reflect these assumptions, we generalize the above utility function to a multidimensional setting: $u\big(X, m(\bar{x})\big|t(n)\big) = F\big(1 - X, m(\bar{x})\big) + t(n)G(\bar{x} - 1/2)$. Let X denote the vector of allocation rates for money and/or task given to the recipient, and let $\bar{x}$ represent the simple average of the dictator's allocation rates across these dimensions. Note that the task allocation rate refers to the proportion of the task that was *not* imposed on the recipient. Based on an analysis of this generalized two-dimensional model following the approach of Andreoni and Bernheim (2009), we derive the following four empirical hypotheses.

H1: Even when the two resources to be allocated are designed to differ clearly in value, a substantial number of individuals will choose allocations that satisfy the condition $\bar{x} = 0.5$.

H2: It is frequently observed that one of the allocation rates exceeds 0.5, particularly in the case of the task, which is deliberately designed to be relatively easy and low in burden.

H3: The average allocation rate $\bar{x}$ will be higher in the two-dimensional setting than in the standard one-dimensional dictator game, reflecting increased concern for fairness.

H4: The money allocation rate will be lower in the two-dimensional condition than in the one-dimensional condition.

H4 is derived from the fact that our experiment is intentionally designed to create a value gap between money and task, such that most dictators are expected to prefer money over the task. The four hypotheses can be summarized as follows. (i) Individuals exhibit psychological resistance to choosing purely selfish allocations across both resources (H3). (ii) Even when the two resources differ in value, fairness tends to be judged by the simple average of allocation rates, giving rise to the superficial 50:50 norm (H1). (iii) Dictators exploit such superficial 50:50 allocations as a justification to secure a larger share of the more desirable resource (H2 and H4).

4. Experimental Design

We conducted a laboratory experiment to study how individuals allocate money and a task under different authority structures. The experiment consisted of three parts.

Part 1: Task Familiarization. Participants first completed a slider task (aligning 12 sliders to target positions), designed to be easy and minimally burdensome (40–90 seconds to complete).

Part 2: A Dictator Game. Participants were randomly paired and assigned roles (dictator or recipient) and one of five treatments, each defining allocation authority over two resources: 1000 Japanese yen in cash and 10 slider tasks introduced in Part 1. Dictators determined the recipient's share of money and/or tasks, with no veto power for recipients. The key manipulation lay in the distribution of allocation authority:

T1 (Standard): One dictator allocates only money.

T2 (Centralized 2D): One dictator allocates both money and task.

T3 (Decentralized 2D): One dictator allocates money, another allocates the task.

T4 (Money + Equal Task): One dictator allocates money; task split fixed at 50:50.

T5 (Task + Equal Money): One dictator allocates task; money split fixed at 50:50.

Participants were informed that others might be in different treatments, but their matched partner received the same instructions. After Part 2, they proceeded individually to Part 3 and left after completing all tasks and payments. Dictators with task authority were told that, since various treatments were implemented in each session, some participants would not be assigned any tasks. Because several participants completed the experiment without tasks, recipients could not identify their specific dictator. This reduced the psychological cost of imposing all tasks on the recipient.

Part 3: Post-Experiment Survey. Participants completed a questionnaire. Its primary purpose was to prevent all participants from finishing Part 2 before payments were prepared, which would have eliminated natural variation in departure times. Participants were informed that payments would be processed in the order of completion of Part 2, and they received cash upon finishing the questionnaire.

5. Experimental Results

The experiment took place on March 4–6 and September 10–12, 2024, at the Kansai University Experimental Economics Laboratory, with 238 student participants across 15 sessions.

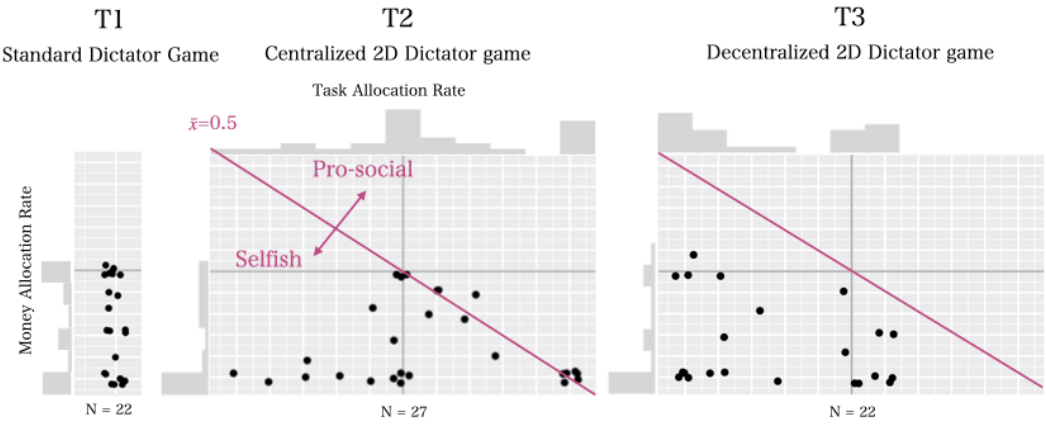

Figure 1: Allocation Decisions

Figure 1 presents scatterplots of allocation decisions in T1–T3, which are of primary interest.[c] The vertical axis shows the proportion of money allocated to the recipient (money allocation rate), and in T2 and T3, the horizontal axis shows the proportion of the task not imposed on the recipient (task allocation rate). In T2 and T3, points on the red diagonal indicate allocations where the average of money and task shares equals 0.5.

In T2, where one dictator allocates both resources, 44.4% of choices fell on this diagonal despite the two resources differing in value. This supports H1. Only about 10% split both money and task evenly, while about 20% kept all the money but accepted the entire task, consistent with H4 that task generosity can function as a justification device for self-interested choices. In T2, no dictator gave more than 50% of the money, yet 44.4% allocated more than 50% of the task, supporting H2 and A1 that fairness is not judged independently across dimensions. Only one out of 27 dictators monopolized both resources, a far smaller share than the proportion who fully monopolized money in T1, supporting A2 that such behavior entails greater psychological cost. The scatterplots for T2 and T3 differ markedly, mainly due to task allocation. In T2, some dictators used task generosity to justify keeping all the money. In T3 this was impossible since money and task were allocated by different individuals, leading to much lower task generosity.

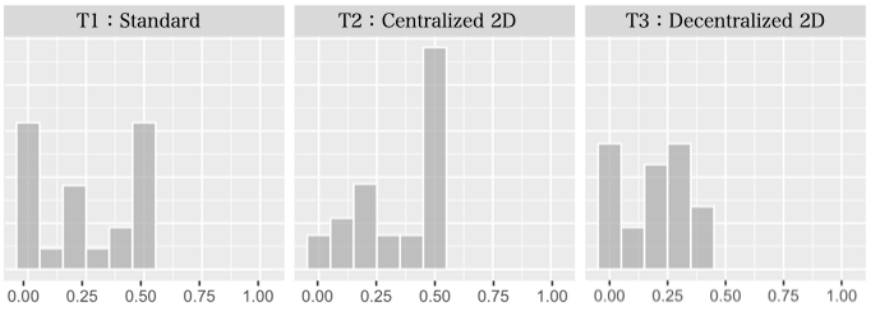

Figure 2: Distribution of Average Allocation Rates

Figure 2 shows the distribution of average allocation rates in T1–T3 (treating the money allocation rate in T1 as the average allocation rate). The proportion of dictators selecting 0.5 allocations is notably higher in T2 (44.4%). This share is significantly above the 9.1% expected if money and task were allocated independently at random (two-sided exact binomial test, $p < 0.001$). These results are consistent with H1 and provide strong evidence for the presence of a superficial 50:50 norm.

Figure 3 summarizes the mean money, task, and simple average allocation rates in T1–T3. In T2, the right panel shows that the average task allocation rate exceeds 0.5, with 44.4% of dictators taking on a large share of the task. A two-sided exact binomial test ($p < 0.01$) rejects the expectation that no such cases occur under independent evaluations of each dimension, consistent

[c] T4 and 5 were included for robustness checks and are omitted from this proceedings paper.

with H2. This supports the view that participants rely on the simple average allocation rate rather than judging each dimension independently, contradicting utility functions such as $F(1 - X, m(\bar{x})) + t_1 G(x_1 - 1/2) + t_2 G(x_2 - 1/2)$. The left panel shows that the simple average allocation rate is higher in T2 than in T1, supporting H3. The middle panel shows that the money allocation rate is higher in T1 than in T2, consistent with H4. Both differences are statistically significant according to one-sided Wilcoxon rank-sum tests (H3: p = 0.0248; H4: p = 0.0374).

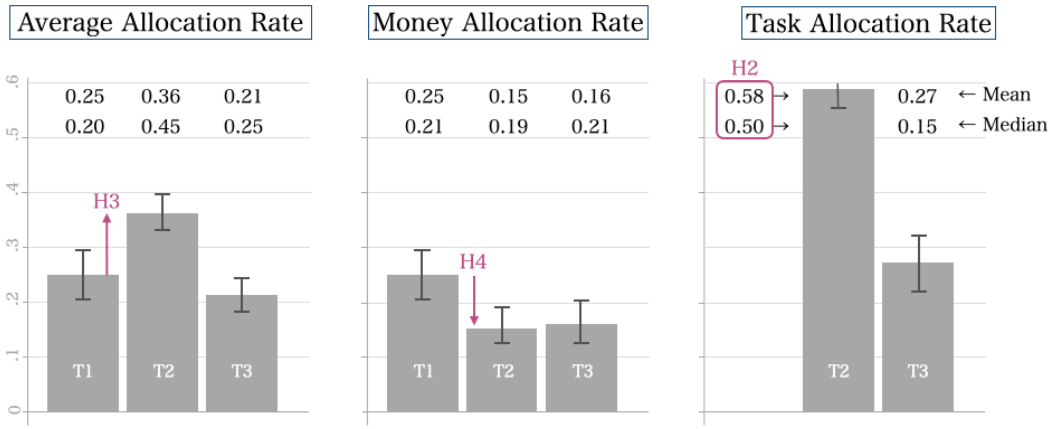

Figure 3: Mean Allocation Rates — Simple Average, Money, and Task

6. Remarks

Our findings support all four empirical hypotheses, thereby supporting the two underlying behavioral assumptions. Fairness in multi-dimensional allocations is often judged by the simple average of allocation rates, and a superficial 50:50 split may serve as plausible deniability, allowing individuals to justify self-serving outcomes rather than reflecting genuine fairness. This constitutes a behavioral norm distinct from the conventional 50:50 norm, in which equal splits tend to emerge when plausible deniability is absent.

Allocation patterns also depended on how authority was delegated, highlighting the role of institutions (List, 2007). Although decentralization may appear fairer, Figure 1 shows that the decentralized treatment (T3) involved more self-serving behavior than the centralized treatment (T2), particularly in task allocations. Dictators in T1 and those responsible for money allocation in T3 made essentially the same decisions; however, far fewer in T3 chose the 50% money split, suggesting that the partner's authority over task allocation strongly influenced their behavior.

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