# *You Wouldn't Steal a Car: Moral Intuition for Intellectual Property*

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Abstract: We conduct an experiment to compare how people respond to the appropriation of rivalrous versus nonrivalrous goods. Analysis of chat transcripts indicates that people use language associated with "stealing" exclusively for rivalrous goods. Moreover, taking rivalrous goods precipitates negative emotional shifts in conversations, while appropriating nonrivalrous goods does not. Even though their work is copied extensively, creators of nonrivalrous goods do not seek intellectual property protection when attribution is assured. These findings help explain why digital piracy in the internet age provokes moral judgments distinct from those involving physical theft. They suggest that our moral evaluations originate more from the rivalrousness of the good than from the act of taking itself and therefore challenge the applicability of intellectual property law frameworks formulated before the advent of widespread digital sharing.

Keywords: Intellectual Property, Experimental Economics, Property Rights, Nonrivalrous goods

JEL codes: C92, D89, K39

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## 1. Introduction

Intellectual property (IP) law grants exclusive rights for creators to incentivize innovation and creativity. These protections also impose social costs. By limiting access or raising prices, IP can slow the diffusion of ideas and deter follow-on creation. Economists and legal scholars therefore debate how to balance incentives with access. Less examined, yet consequential for enforceability, is whether people intuitively regard unauthorized use of intellectual property as morally wrong.

This question gained cultural prominence in the early 2000s, when digital piracy expanded rapidly.[1] To public perceptions, the Motion Picture Association of America (MPAA) released an anti-piracy trailer shown before films that argued: (1) "You wouldn't steal a car," (2) pirating movies constitutes "stealing," and (3) piracy is a crime. The very need for this campaign, and the ridicule it attracted, signals persistent disagreement over whether digital copying constitutes a moral violation.

The moral ambiguity persists. In the 2020s, large-scale machine-learning models intensified disputes over digital ownership and reuse. Large language models (LLMs) train on vast corpora of online text, often scraped without permission or compensation. As the internet continues to enable frictionless copying and remixing of digital goods, identifying the psychological foundations of IP compliance is increasingly important.

Stable property rights are a necessary condition for economic growth and investment. Because theft undermines exchange, societies develop rules against it to unlock gains from specialization and trade.[2] These rules arise to prevent perceived harm and adapt to the resources a society values. In contemporary economies, "idea goods" comprise a substantial share of value. Our paper examines how norms evolve when individuals evaluate harm after the taking of nonrivalous resources such as digital files.

We report experimental evidence on moral evaluations of unauthorized appropriation, contingent on whether the good is rivalrous or nonrivalrous. In a virtual environment, participants produce and exchange two types of resources: nonrivalrous "discs," replicable at zero marginal cost, and rivalrous "seeds," which entail positive marginal cost and cannot be simultaneously possessed or consumed by multiple individuals. Certain treatments allow unauthorized taking, which permits observation of whether participants classify such actions as moral transgressions.

Participants consistently label the taking of rivalrous goods as "stealing," whereas they do not apply the same term to the taking of nonrivalrous goods. Taking rivalrous goods elicits stronger negative sentiment in spontaneous real-time communications than does taking nonrivalrous goods. By contrast, producers of nonrivalrous goods frequently encourage broad sharing of discs.

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[1] Napster, launched in 1999, enabled users to download music without paying rights-holders. In response, the Recording Industry Association of America (RIAA) filed a lawsuit that led to Napster's shutdown in 2001. The platform's rapid rise and fall ignited a public discourse on the ethics of copying digital content. Although Napster violated copyright law, many users did not view their actions as wrong or report downloading to legal authorities.

[2] Both physical property theft and intellectual property theft impose costs on the American economy. The FBI's Uniform Crime Reporting Program found that about $13 billion worth of property was stolen in 2019. More recent comprehensive figures are unavailable due to the FBI's transition to a new data collection system that disrupted national crime statistics. Estimates for the impact of IP theft are fundamentally harder to measure, but the IP Commission estimates losses to the American economy of $225-$600 billion annually (including foreign theft of commercial trade secrets) (Blair & Huntsman, 2017).

These findings indicate that moral judgments regarding property violations depend not only on legal status but also on the intrinsic characteristics of the good. Our experiment supports Wilson's (2020) view that property functions as a human convention grounded in symbolic cognition and socially mediated recognition of harm.[3] In our setting, where attribution to producers of nonrivalrous goods remains visible, participants do not regard the taking of such goods as theft within the small group. This linguistic pattern emerges from direct comparisons (both within-session and between-session) of how participants describe the taking of rivalrous versus nonrivalrous goods.[4]

## 2. Related Work

The relationship between intellectual property rights and innovation embodies a tension between creator incentives and the social costs of restricted access. Scotchmer (1991) theorizes that patent protection induces investment by allowing innovators to internalize rents, while simultaneously imposing social costs by impeding follow-on creativity. This trade-off has grown more complex in the digital age, as Peukert & Windisch (2025) document in their survey.[5]

Recent natural experiments provide empirical evidence of these trade-offs (Williams, 2013). Biasi & Moser (2021) exploit a World War II policy shock when the U.S. government's Book Republication Program released German-owned scientific works as if in the public domain. Citations to these works rose sharply after the intervention, indicating that easing access to nonrivalrous knowledge can accelerate cumulative innovation.

Researchers continue to debate how digital piracy shapes economic outcomes. Using 2002 data, Oberholzer-Gee & Strumpf (2007) estimate that piracy did not reduce record sales, despite contemporaneous revenue declines in the recording industry. Subsequent studies argue that piracy did hurt traditional media providers (Liebowitz, 2016; Rob & Waldfogel, 2007; Zentner, 2006). Estimates from studies of 2000s music file-sharing range from no effect to large negative effects, and Hammond (2014) even finds sales increases in some settings. The resulting dispersion in parameter estimates is unusually wide for an empirical question in economics.

On the supply side, Waldfogel (2012) concludes that the quantity of new consequential recorded music did not decline after Napster. Causal inference proves difficult because technology simultaneously redirected consumers toward streaming and away from traditional media products during the period when digital piracy expanded. A laboratory approach helps address these challenges by holding technology constant. Moreover, because consumers may not truthfully report illicit behavior, an incentivized environment in which we can directly observe and measure piracy offers additional value.

A parallel literature investigates the behavioral and moral foundations of digital piracy. Hashim et al. (2018) extend the Theory of Planned Behavior, showing that individuals often rationalize digital copying as "victimless" and that targeted nudges can heighten perceived moral obligations. Siponen et al. (2012) develop a comprehensive model in which neutralization techniques and moral beliefs shape

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[3] "Out of the habits of responding to claims of 'This is mine' emerged a fitting custom found presumably in every society: Do not steal." (Wilson, 2020, pg. 58)

[4] A previous trading experiment only allowed us to observe the perception of unauthorized use of nonrivalrous goods, without the direct comparison of taking between resource types (Buchanan & Wilson, 2014).

[5] Our experiment allows for what Peukert & Windisch (2025) term demand-side copyright infringement, but our lab participants cannot commit supply-side copyright infringement.

software-piracy intentions. Their results indicate that rationalization strategies, especially appeals to loyalty and moral condemnation of others, operate alongside formal legal deterrents.

Laboratory experiments complement observational studies of IP's effects on innovation and creative output. Brüggemann & Bizer (2016) survey experimental methods for studying innovation. Benslimane et al. (2023) test whether voting on IP reform alters creative effort, finding that the most talented innovators do not vote in favor of stronger IP. Brüggemann & Meub (2017) examine innovation contests and show how institutional rules govern cooperation and creative performance using real-effort word tasks that simulate sequential innovation. Lampert et al. (2025) analyze multi-agent environments and find that abolishing IP protections sometimes improves group outcomes by accelerating diffusion and recombination of ideas. Brüggemann et al. (2016) experimentally demonstrate that IP may hinder sequential innovation. Existing experimental studies typically evaluate innovation output and economic incentives rather than the moral perception of taking. We address this gap by studying how individuals classify and morally evaluate taking across goods that differ in rivalry.

Unlike previous work that models real-effort tasks or creativity, we isolate perceptions of taking by comparing responses to inherently different types of goods. Our experimental design incorporates spontaneous real-time chat, enabling social norms around ownership to emerge and be expressed in natural language.

By capturing intuitive responses to nonrivalrous taking, in a controlled setting, our study provides micro-foundational evidence for why digital reuse remains morally contested. This perspective bridges the economic literature on IP's welfare effects with the psychological literature on moral reasoning, clarifying why legal definitions that equate digital piracy with theft may diverge from moral intuitions grounded in rivalry and perceived harm.

## 3. Experimental Design and Hypotheses

The experiment creates opportunities for participants to take actions that others may interpret as harmful. The environment includes resources over which participants may develop a sense of ownership if the resource characteristics prompt endogenous moral reasoning. Importantly, the instructions avoid property-laden terms such as "own" or "steal." The appendix provides instructions that map available actions to payoffs.

### 3.1. Environment

Each period, participants receive a fixed endowment of production time. There are two types, artists and farmers, with distinct production options. Both can produce seeds, a rivalrous good that cannot be simultaneously possessed or consumed by multiple individuals. Artists can also invest production time to create discs, a non-rivalrous good shareable at zero marginal cost. Discs are analogous to digital goods (e.g., music files). The potential consumption value of one disc for the group equals 18 cents multiplied by the number of participants. Farmers can also invest production time to plow fields that multiply the value of seeds.

Producing one disc requires 10 seconds and displaces the production of 20 seeds, as shown in table 1. Because seeds may later be multiplied in a field, the opportunity cost of creating a disc can exceed 20 cents. By contrast, the private value of a disc to its creator is 18 cents. Thus, an individual artist earns (slightly) more by producing seeds than by consuming their own disc.

**Table 1 Resource Production Time (seconds)**

| | |
|---|---|
| Disc | 10 |
| Farm | 10 |
| Seed | 0.5 |

**Table 2 Parameters of resource values**

| | |
|---|---|
| Disc value | 18 |
| Seed value | 1 |
| Seed value in a field with 1 occupant (k=1) | 1.5 |
| Seed value, 2 occupants | 3.1 |
| Seed value, 3 occupants | 2.9 |
| Seed value, 4 occupants | 2.6 |
| Seed value, 5 occupants | 1.9 |
| Seed value, 6 occupants | 1.2 |
| Seed value, 7 occupants | 1 |
| Seed value, 8 occupants | 0.8 |

Even if an individual artist *i* believes that they will get to share the discs made by others, there is a dilemma that could lead to no discs getting produced. Let $D_i \in \{0,1\}$ indicate whether artist *i* produces a disc. With four artists, define the number of discs that get produced by others as

$$\mathrm{D_{-i}} = \sum_{\substack{\mathrm{j=1} \\ \mathrm{j \neq i}}}^{4} \mathrm{D_j}.$$

Assume each disc yields 18 cents per consumer and each seed yields at least 1 cent. If discs are shared, artist *i*'s payoff is

$$\pi_i = \begin{cases} 18 \cdot D_{-i} + 18 \;\; if \;\; D_i = 1 \\ 18 \cdot D_{-i} + 20 \; if \;\; D_i = 0. \end{cases}$$

Shirking ($D_i = 0$) strictly dominates producing ($D_i = 1$) by at least 2 cents for all $D_{-i}$:

$$\pi_i(D_i = 0) > \pi_i(D_i = 1) \text{ for all } D_{-i}.$$

Hence, under-provision can arise in equilibrium. Because a field can multiply seed value by more than three, the opportunity cost of disc production may block the group from realizing full gains from trade.

Production time not used for discs or fields can produce seeds for the producer's own consumption. When seeds are transferred or taken, only the final holder at period end obtains their value, reflecting rivalry. Seeds can function as both a consumption good and a medium of exchange.

Farmers can allocate 10 of the 16 available seconds per period to plow a field. Fields are rivalrous: as additional players enter, access for others diminishes and the seed multiplier follows the schedule above in Table 2. Unauthorized entry by too many visitors injures the initial farmer by diluting the return. Because of the high fixed cost of plowing and the nonmonotonic multiplier, four total

occupants ($k = 4$) maximize efficiency (see Table 2). The field's value falls sharply when a fifth person enters ($k = 5$), at which point the farmer incurs a loss.

It is worth noting that the opportunity cost of plowing a field is considerable. Out of 16 total seconds of production time for each period of the game, a field takes 10. Building a seed only requires half of a production second.

There are eight participants per session, four artists and four farmers. The group maximizes efficiency when two farmers plow fields and share each field with three others ($k = 4$). Because all players hold seeds, they can use seed transfers to rebalance earnings and compensate farmers for the fixed cost of plowing.

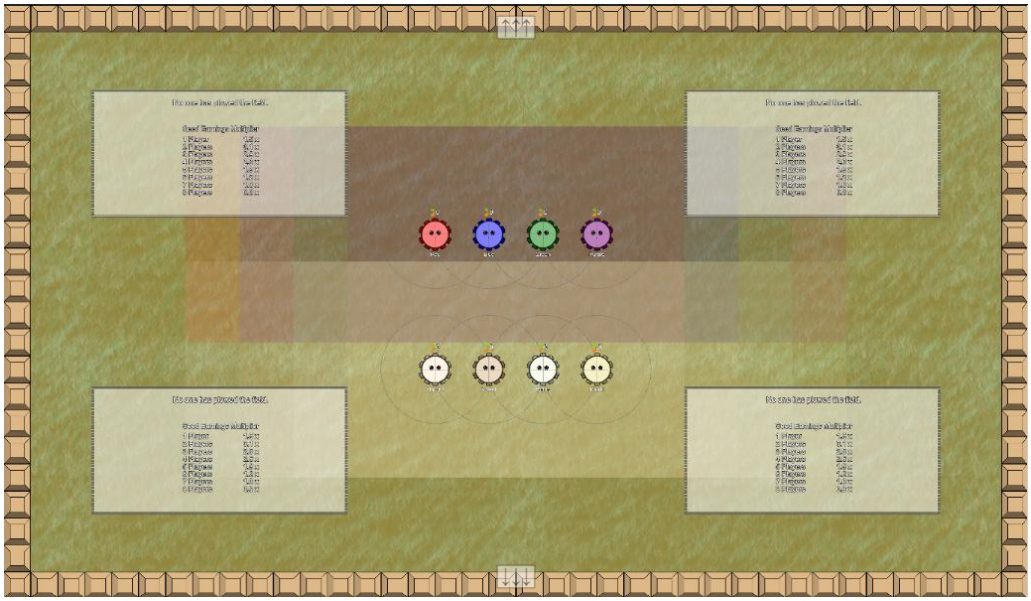


**Figure 1 Experimenter View Screenshot of the start of a period**

Figure 1 depicts the experimenter's view of the virtual world at the first second of each period. At $t = 1$, no production has occurred; the world contains no resources. The four light rectangles indicate unplowed fields.

In autarky, each player can devote all production time to seeds and earn 32 cents (0.5 seconds per seed × 16 seconds = 32 seeds at 1 cent each), yielding a group total of $2.56 per period for eight players. Coordination, i.e., inducing field plowing and disc production, enables substantially higher payoffs.

With group size $n = 8$, a single disc worth 18 cents per consumer generates a group surplus of $1.44 if shared (0.18 × 8). If all four artists produce and share their discs, the fully distributed disc value equals $5.76.

We next compute group earnings from seeds and fields under an allocation that maximizes joint surplus. In this configuration, two farmers plow fields, and each field hosts four occupants ($k = 4$), which yields the 2.6-times multiplier from Table 2. For the calculation, assign seed holdings within each field as

follows: three occupants hold 12 seeds each, and the fourth, a farmer, holds 32 seeds. Let *MGS* denote the group's earnings from multiplied seeds in one round.

For one field:

$$\text{Seeds in field} = 3 \times 12 + 32 = 68, \quad \text{Payoff} = 2.6 \times 68 = 177 \text{ cents (rounded)}.$$

With two identical fields:

$$\text{MGS} = 2 \times 2.6 \times (3 \times 12 + 32) = \$3.54 \text{ (rounded)}.$$

Total group earnings at this efficient configuration therefore equal:

$$\$5.76 \text{ (shared discs)} + \$3.54 \text{ (MGS)} = \$9.30,$$

which is over 3.5 times the autarky benchmark of $2.56.

Participants control avatars to enter fields or approach others for trade. Each period lasts 110 seconds. Production actions are available only during the first 80 seconds; trading and chat remain available throughout. Field multipliers apply to participants who occupy a field at the end of the period.

The session comprises 24 periods, with a short chat break after every five periods. Participants do not receive information about the total number of periods or the timing of the final ("endgame") period; they are only told that the study lasts approximately one hour.

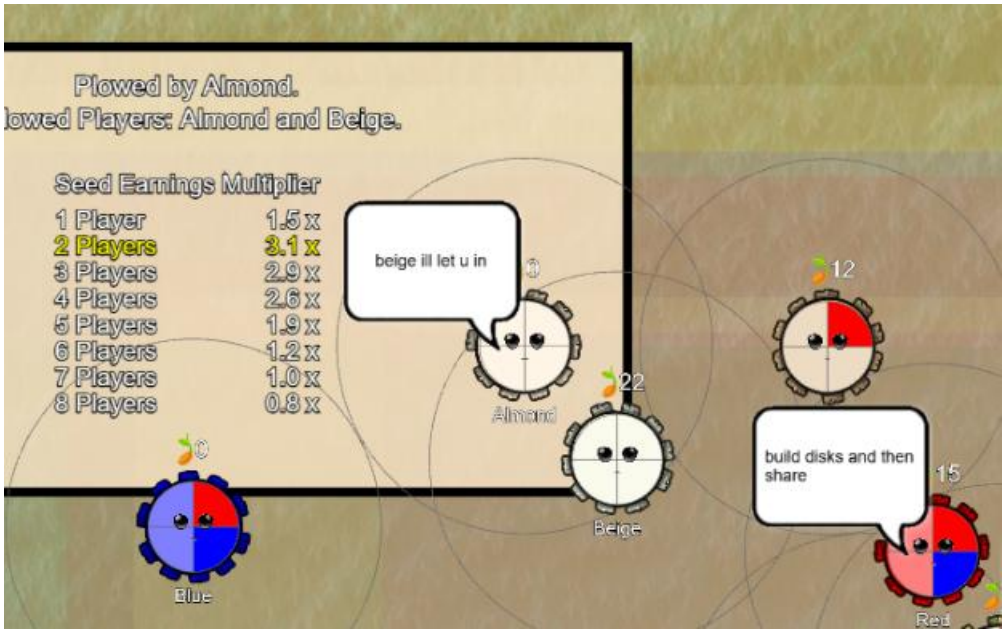



**Figure 2 Screenshot of Session NoSeedPR 3**

Figure 2 displays a plowed field initiated by Almond, currently occupied by Almond and Beige. Each participant's seed holdings appear above their avatar as public information. Disc ownership is likewise visible: three avatars display a dark pie segment indicating possession of Red's disc, and two avatars display a segment for Blue's disc. In the screenshot, Beige shows no colored pie segments and

thus holds no discs. Because seed and disc holdings are observable, participants can infer others' period earnings.

Participants can transfer movable goods at any time. Selecting another avatar opens a menu listing available items for transfer. In designated treatments, participants also possess a symmetric ability to take movable goods from others, enabling direct observation of responses to unauthorized appropriation.[6]

### 3.2. Institutions and Incentives

**Table 3 Treatment Enforcement Matrix**

| | Software-enforced protection | | |
|---|---|---|---|
| Institution Name | Seeds | Discs | Fields |
| *PR* | x | x | x |
| *noFieldPR* | x | x | |
| *noDiscPR* | x | | x |
| *noSeedPR* | | x | x |
| *noPR* | | | |

Groups achieve higher earnings when all discs are produced and at least some fields are plowed. Our design permits analysis of institutional conditions that support these outcomes and observation of how participants develop endogenous property conventions.

Table 3 defines the *PR* treatment, in which taking and trespass are prohibited for all resources. When seeds and fields carry protected rights, a participant transfers seeds only by consent (via sending), and the farmer who paid the fixed cost to initiate a field controls entry.

Under *PR*, participants can more readily solve production and coordination problems. A farmer who seeks compensation for plowing can condition entry on seed payments. Artists can similarly bargain, either for access to fields or for see payments in exchange for discs. Non-cooperative participants can be excluded from exchange and thus remain at autarky earnings.

We test five institutional regimes to attribute verbal complaints about property violations to specific resource types. By allowing only one resource to be taken in certain sessions, the design lets us link observed conflicts to the corresponding good. If we studied only *noPR*, attribution would be ambiguous because any of the three property harms could trigger a conflict. The *PR* condition serves as a control, enabling assessment of whether participants can solve the production problem when property stability holds by default.

[6] The *take* function activates a "tractor beam" on the screen, extending from the taker to the counterpart player's avatar. The beam immobilizes the counterpart for one second, visibly signaling to nearby players that a take action has occurred.

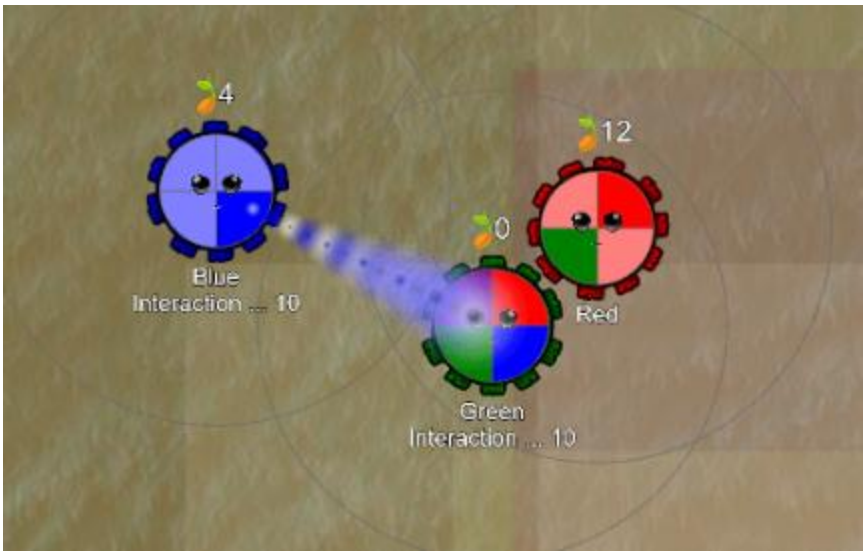



**Figure 3 Screenshot of player Blue taking a disc from player Green in session noDiscPR7**

Figure 3 depicts an avatar taking a disc from the green artist.[7] Actions in the virtual world occur publicly and visually. When an event that participants might construe as "theft" takes place, observers can witness it in real time, comment, and reveal their moral judgments. The experiment's central objective is to measure how distinct resource types elicit distinct linguistic responses and institutional arrangements when taken without permission.

To this end, the design permits discs to be taken while preserving attribution to the original creator. For example, if Red discs are taken, all participants can still identify Red as the creator. This feature mirrors many digital goods, written or recorded works distributed online that retain authorship metadata. We note, however, that recent practices in which LLMs rewrite text scraped from books or articles may break this mapping by severing attribution.

### 3.3. Hypotheses

Resource constraints are the same in every treatment. All groups have identical production possibilities, trading options, and communication channels. The treatment differences involve minor adjustments to the exchange rules, none of which limit what groups can produce, how they can coordinate, or the total earnings they can achieve.

Guided by this invariance, we formulate several null hypotheses and treat each session as an independent observation. In principle, production, earnings, and negative sentiment could remain equal across treatments. Empirically, we proceed in three comparisons. First, we compare *PR* to *noPR* to test whether the absence of formal property protection inhibits cooperation and investment in the multiplicative goods. Second, we compare *noSeedPR* to *noDiscPR,* which isolates the contrast between unprotected rivalrous and unprotected nonrivalrous goods. Third, we compare *PR* to *noFarmPR* to evaluate whether open access to fields reduces earnings or increases negative sentiment.

[7] A debate in IP policy is about "access vs. incentives." Disc protection should help with production incentive but might limit access to discs that have already been created. It is an open empirical question - which regime will result in higher group earnings, in our environment?

To quantify sentiment, we classify words using the Bing Liu Lexicon and test for differences in the frequency of negative or positive terms.

In more detail, the comparison between *PR* and *noPR* allows us to test the following hypotheses:

Null Hypothesis 1a (Production): The number of farms plowed and discs produced in *PR* equals that in *noPR*.

Null Hypothesis 1b (Earnings): Group earnings in *PR* equal those in *noPR*.

Null Hypothesis 1c (Sentiment): The number of negative words used in *PR* equals that in *noPR*.

We conducted eight sessions in each of the five treatment conditions (40 sessions total), with eight participants per session, yielding a total of 320 undergraduate participants from a private, mid-sized, liberal arts university in the United States.[8] None had prior experience with comparable experimental environments. Participants earned an average of $18.52 for a one-hour session, plus an additional $7 for showing up on time. Complete experimental instructions appear in the appendix.

## 4. Results

### 4.1. Treatment Averages and Hypothesis Testing

Table 4 reports period averages by treatment. In *noDiscPR*, groups produce an average of 3.5 discs per period; in practice, four artists usually create their disc, even without exogenous protection. The absence of disc protection does not appear to depress disc production in groups of eight. Average disc output is highest in *NoDiscPR* and *NoPR*. The lower disc average in *noFieldPR* reflects several sessions with very low disc production (see Figure 4).

**Table 4 Treatment Averages for Groups, Per Period**

| | *noDiscPR* | *noFieldPR* | *noPR* | *noSeedPR* | *PR* |
|---|---|---|---|---|---|
| Earnings | $6.47 | $6.09 | $6.52 | $5.60 | $6.20 |
| Discs Produced | 3.5 | 2.8 | 3.5 | 3.3 | 3.3 |
| Fields Plowed | 3.3 | 2.9 | 2.5 | 2.9 | 2.8 |

**Table 5 *P*-value of a Wilcoxon Rank Sum Test to compare session totals for all periods between treatments**

| | Test of Null Hypotheses | | | |
|---|---|---|---|---|
| Null Hypotheses | **Total Production (discs/farms)** | | **Total Earnings** | **Negative Sentiment Word Count** |
| ***PR = noPR*** | Discs produced | *p*-val. = 0.210 | *p*-val. = 0.505 | *p*-val. = 0.958 |
| | Fields plowed | *p*-val. = 0.574 | | |
| | | | | |
| ***noSeedPR = noDiscPR*** | Discs produced | *p*-val. = 0.790 | *p*-val. = 0.038 | *p*-val. = 0.031 |
| | | | | |
| ***PR = noFieldPR*** | Fields plowed | *p*-val. = 1.00 | *p*-val. = 0.878 | *p*-val. = 1.00 |

[8] We preregistered a sample size of 8 sessions per treatment through the AEA RCT registry. https://www.socialscienceregistry.org/trials/14246

Table 5 presents Wilcoxon rank-sum tests using session totals (eight independent observations per treatment). In most comparisons, we do not reject equality of medians, consistent with substantial within treatment variance (Figures 4-6).

In aggregate economic outcomes, *PR* and *noPR* yield similar results. Some *noPR* sessions exhibit orderliness and high earnings because participants who *could* appropriate often refrain. Conversely, several *PR* sessions organize slowly and defer gains from trade, not due to theft, but due to insufficient effort or creativity.[9]

Over time, groups that establish cooperation generally maintain it without late-stage decay. Episodes of defection are often followed by rapid forgiveness once participants recognize the financial gains from working together. At times, groups use targeted punishment to induce contributions.

Given comparable production across *PR* and *noPR*, the absence of an earnings difference (Hypothesis 1b) is unsurprising. Easier disc distribution under *noPR* plausibly raises average earnings when disc protection is absent.[10]

**Result 1:** Earnings do not differ significantly between the *PR* and *noPR*.

Figure 4 plots disc units produced (dark bars) and consumed (light bars) by session.[11] Most groups converge toward full production and consumption. The lack of disc protection appears to facilitate distribution because consumers can take any disc they lack. Sessions with notably low disc production occur under *noFieldPR*, not under *NoPR* or in *NoDiscPR*. When stability of traditional physical property breaks down, some groups develop mutual resentment and apprehension that impede gains from agglomeration. Moreover, when artists can freely enter any field to obtain the multiplier, the opportunity cost of foregoing seeds rises, which helps explain the higher incidence of low disc production in *noFieldPR*.

Figure 5 shows fields plowed (dark bars) and occupants (light bars). The dashed red line marks the two-field optimum. Groups typically overinvest in fields. By the end of the period, the modal arrangement allocates two people in each field, producing light bars roughly twice the height of the dark bars.

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[9] While property institutions play a critical role in economic development; these findings remind us that, although such institutions may be necessary, they are not sufficient. Buchanan and Wilson (2014) also observe this in IP settings without entrepreneurial actors.

[10] In this environment, within a small group operating under conditions of attribution and reputation, the disc "production problem" does not appear to present an insurmountable obstacle. These results tend to support the "access" position in the "access versus incentives" debate in IP; however, under different experimental conditions, the opposite pattern might emerge.

[11] For example, if all 4 discs are produced in a period, then there could be up to 32 consumption counts. That could total up to 768 consumptions over 24 periods.

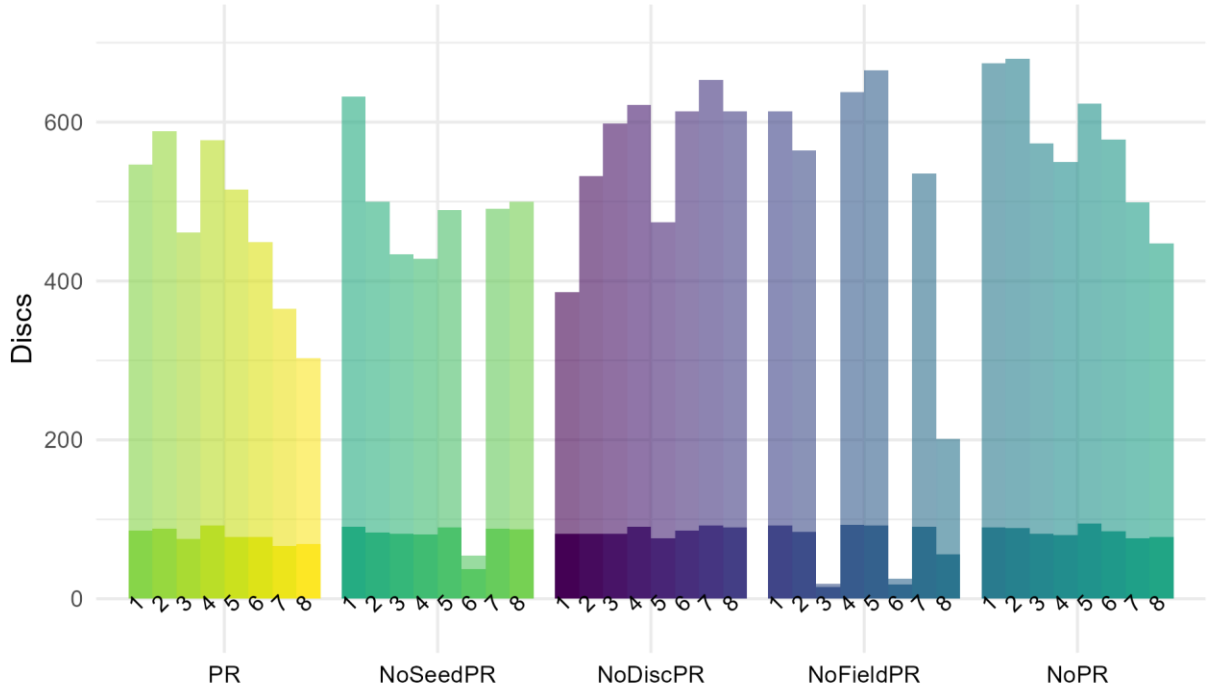



**Figure 4 Disc Production and Consumption by Session (All Periods)**

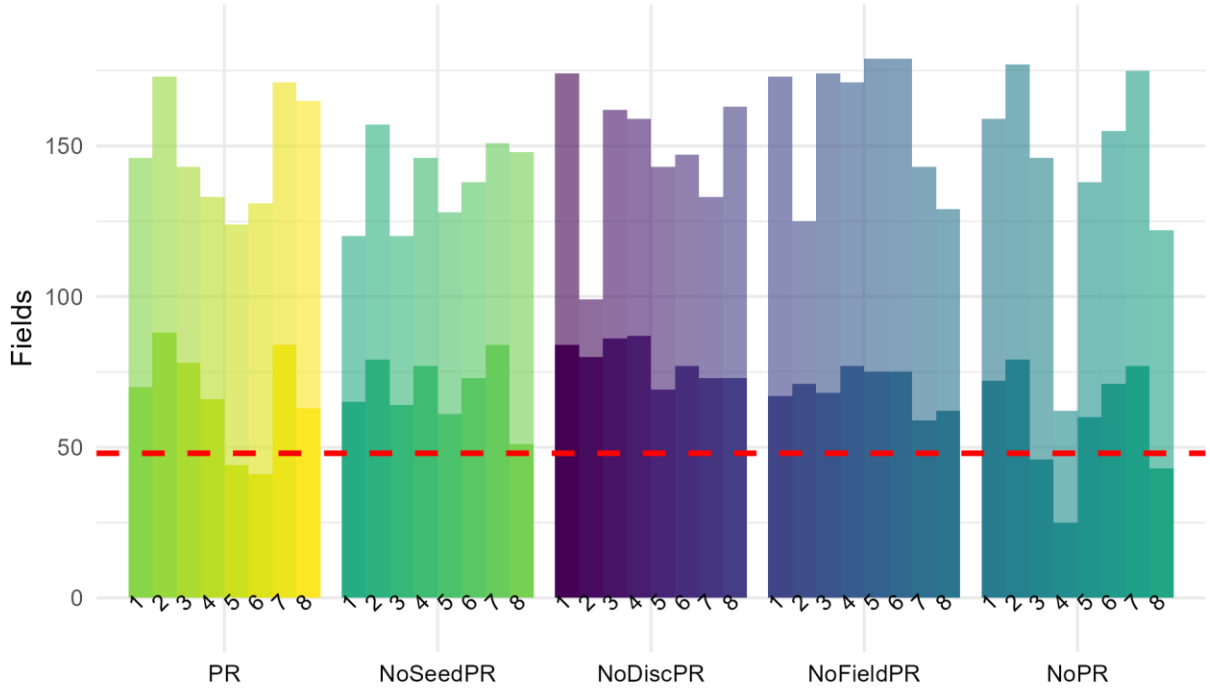



**Figure 5 Fields Occupied and Claimed by Treatment, all periods**

The share of the earnings accruing to artists varies little across treatments. Groups often converge to egalitarian allocations. When every artist produces a disc, every farmer plows a field, and participants form pairs to occupy fields, all eight earn the same amount each period without transfers. This visual symmetry may anchor groups at a local optimum of plowing all four fields rather than switching to the slightly higher-payoff configuration with only two fields.

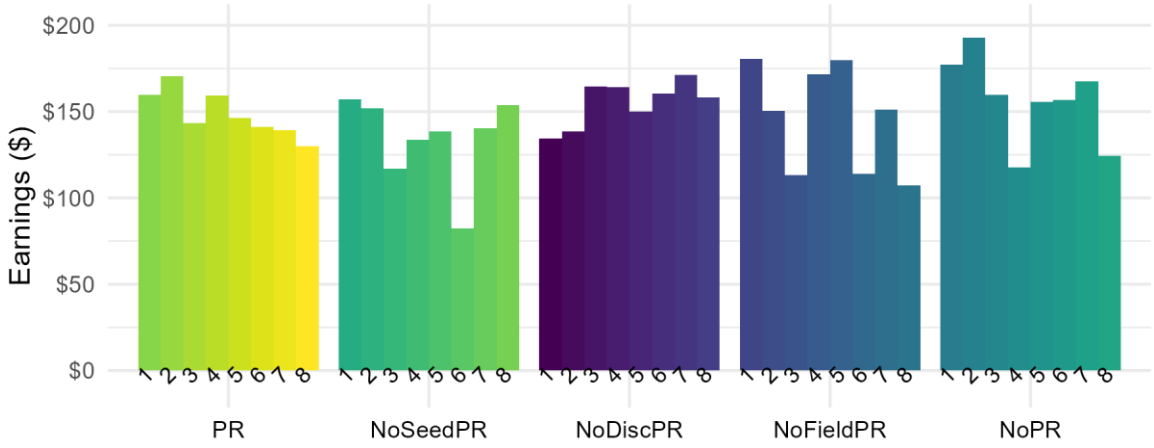



**Figure 6 Earnings by Session (All Periods)**

Figure 6 reports cumulative earnings. The four sessions with low disc production in Figure 4 also post the lowest earnings. The high variance in *noPR* and *noSeedPR* partly reflects groups that succeeded because they *could* appropriate seeds yet refrained (see Figure 8). Earnings in *PR8* are notably low. Despite automatic stability of possession, some groups are slow to distribute disc broadly (Figure 4, *PR8*).

**Result 2:** Earnings in *noDiscPR* are significantly higher than in the *noSeedPR*.

We find *noDiscPR* earnings exceed *noSeedPR* ($p$-value = 0.038). When seed theft generates disorder, groups fail to resolve production incentives and do not realize mutually beneficial exchange. Although disc distribution remains high in all *noDiscPR* sessions, disc consumption in *noSeedPR6* is nearly absent.

Seed theft per se does not reduce end-period earnings. Reallocation leaves totals unchanged. However, violations of rivalrous property generate resentment and fear that erode trust and cooperation needed to exploit multiplicative goods. Linguistic evidence corroborates this mechanism. Rivalrous property violations provoke anger and make groups poorer.

We next examine negative language. The incidence of negative words is significantly higher in *noSeedPR* than in *noDiscPR*. In seed-taking sessions, participants use serious, correctly spelled negative terms that trigger the Bing sentiment count. While chat often includes joking, participants respond earnestly to perceived personal harm. By contrast, unauthorized disc taking does not elicit negativity, a pattern we confirm qualitatively.

**Result 3:** Participants use significantly more negative words in the *noSeedPR* than in *noDiscPR*.

A nonparametric test indicates that *noSeedPR* sessions contain a higher frequency of negative words than *noDiscPR* ($p$-value = 0.031). This pattern suggests participants interpret seed taking as an injury, whereas they do not treat disc taking similarly. We caution that the Bing sentiment dictionary is a blunt instrument for thousands of lines of chat data. Accordingly, we complement these statistics with narrative and qualitative analysist to capture the sequential, contextual nature of each session and to foreground participants' moral intuitions across categories of resources.

### 4.2. Text Analysis and the Emergence of Institutions

Because the Bing Liu Lexicon classifies "steal" as negative, discussions invoking theft contribute to the sentiment gap between *noSeedPR* and *noDiscPR* (Result 3). Table 7 reports, by treatment, the total count of steal-related tokens aggregated across sessions, the number of unique participants who used such terms (to rule out single-speaker outliers), and the observed grammatical variants and synonyms.

**Table 6 Words related to stealing, count by treatment**

| Treatment | Word count | Count unique participants | Keywords |
|---|---|---|---|
| ***noDiscPR*** | 0 | 0 | |
| ***noFieldPR*** | 1 | 1 | `steal` |
| ***noPR*** | 46 | 21 | `stealing, steal, stole, robbing, rob, stolen` |
| ***noSeedPR*** | 48 | 21 | `steals, stealing, steal, stole, stolen` |

**Result 4:** Participants use "steal"-related language at a significantly higher rate when seed taking is possible (in *noSeedPR* and *noPR*).

To assess the statistical significance, we construct a 2×2 contingency table at the session level for *noDiscPR* versus *noSeedPR* (Table 8) and apply Fisher's Exact Test. The test yields a $p$-value = 0.001, indicating a robust association between treatment and the appearance of steal-related language. This evidence reinforces Result 3. Nearly every *noSeedPR* session contains at least one steal-related term; the lone exception (*noSeedPR2*) exhibits no taking actions (Figure 8).[12]

[12] Some of the instance of the word "steal" refer to the hypothetical possibility of taking seeds, written in the chat by individuals who have not observed much actual seed taking. The idea of it happening, inspired by seeing that there is a "take" option in the interaction menu, prompts the use of the word "steal" in their discussions.

**Table 7 Sessions that contain a steal-related word**

| | *noDiscPR* | *noSeedPR* | Total |
|---|---|---|---|
| Steal-related Word Present | 0 | 7 | 7 |
| Steal-related Word Absent | 8 | 1 | 9 |
| Total | 8 | 8 | 16 |

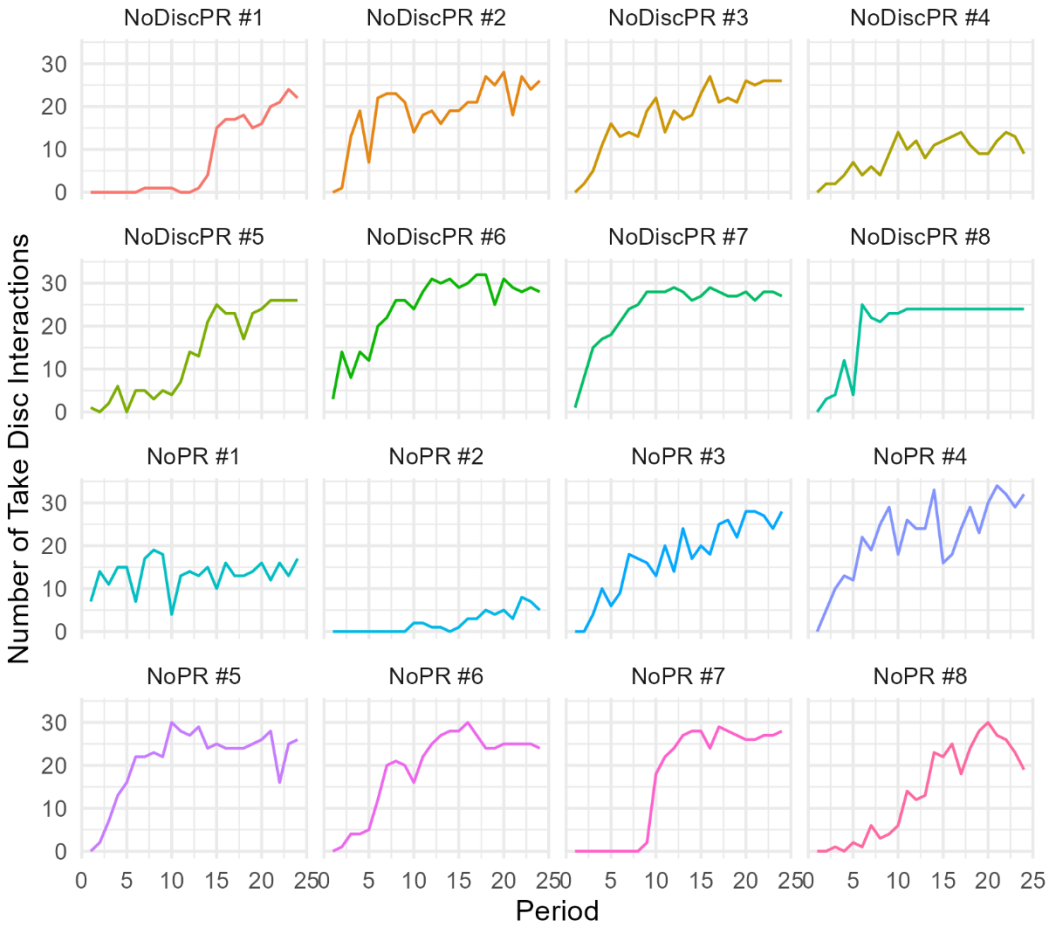



**Figure 7 Take Disc Interactions Over Time**

The absence of "steal" terminology in *noDiscPR* does not reflect a lack of disc-taking. Figure 7 shows that disc taking occurs frequently whenever permitted. Taken together, Figures 7 and 8 document more disc takes than seed takes.[13]

Figure 8 also indicates that seed taking often diminishes after an initial burst. Chat transcripts register moral outrage and, at times, threats of sanctions directed at seed takers. Disc taking follows a different trajectory. It typically starts gradually, without explicit invitation from artists, and in some sessions scales up as groups adopt taking as the primary distribution channel. Many artists endorse disc

[13] The quantity of seeds transferred in a seed take interaction can range from 1 to everything the target is holding.

taking as a practical means to achieve broad distribution and consumption, frequently labeling the practice as "sharing." Cases in which artists contest disk taking are rare; we analyze those exceptions in the vignettes below.

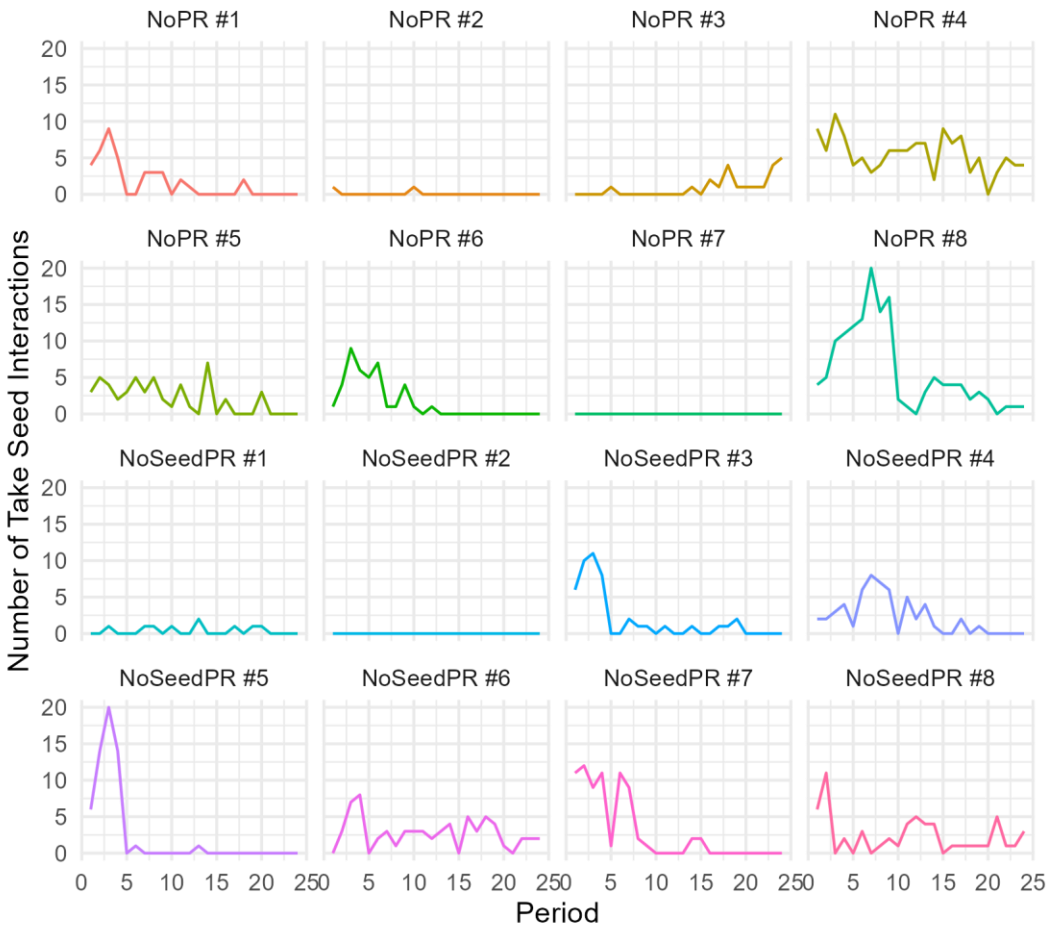



**Figure 8 Take Seed Interactions Over Time**

Seed taking frequently triggers direct rebukes such as "stop stealing." By contrast, participants almost never use "steal"-related terms in either *noDiscPR* or *noFieldPR*.[14]

Farmers rarely comment on unauthorized field entry. In rare cases, farmers who cannot exclude entrants voice injury and request a change in behavior. In *noFieldPR3* (Table 9), the farmer expresses clear frustration and explicitly asks the trespasser to leave.

Beige tells the trespasser, "you are hurting me," invoking financial harm that arises only when field trespass is possible. That session also exhibits relatively low disc production (see Figure 4), which the farmer interprets as inequitable support for artist Blue, who was not contributing. Blue notes in chat that artists can profit by producing 32 seeds for themselves and entering any field. Another artist, Green,

[14] The one "steal" word in *noFieldPR* refers to a farmer starting a field in a box that had been occupied by someone else in a previous period, not in reference to trespassing.

labels Blue's behavior as "unfair." This sequence helps explain why three *noFieldPR* groups generated low disc production.

**Table 8 Chat in Session noFieldPR3**

| Period | Player | |
|---|---|---|
| 19 | Blue | Im making more money in a group of 3 while not sharing seeds |
| 20 | Beige | but ur hurting me |
| 20 | Beige | go join someone else's farm |
| 21 | Green | blue is being unfair |
| 22 | Beige | bruh people gotta just leave us be |

The appearance of terms such as "hurting" suggests that, if permitted, groups would adopt rules barring trespass into a plowed field (analogous to restricting access to a privately owned factory). Notably, participants do not use comparable harm language to describe disc taking.

To contextualize the steal-related conversations, we present word clouds of the most frequent terms and phrases used in participant discussions.[15]

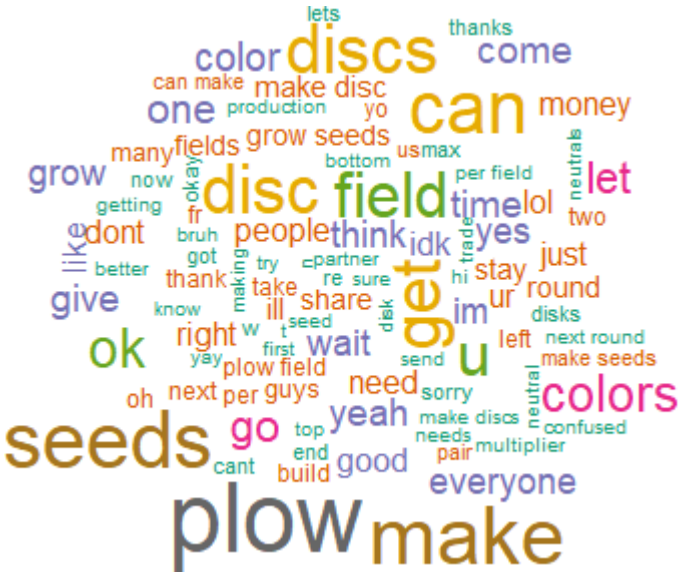



**Figure 9 noDiscPR Wordcloud**

[15] Prior to analysis, we removed standard stopwords (i.e., "and") as well as color names (i.e., "Blue"). The word clouds incorporate bigrams.

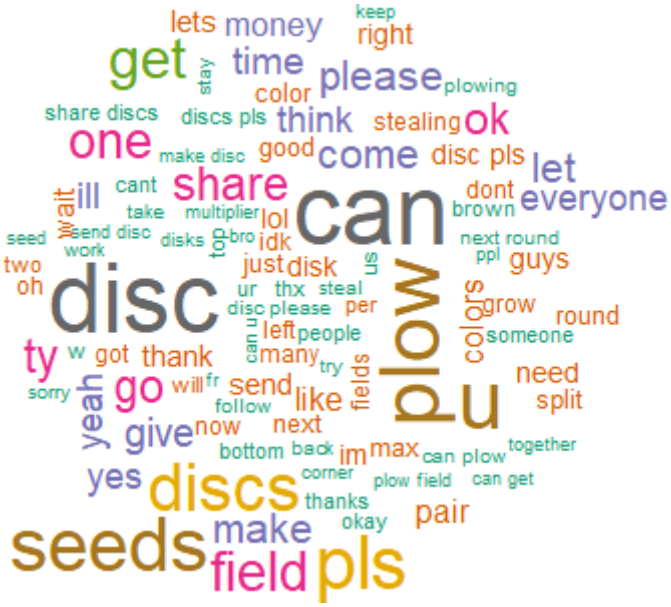



**Figure 10 noSeedPR Wordcloud**

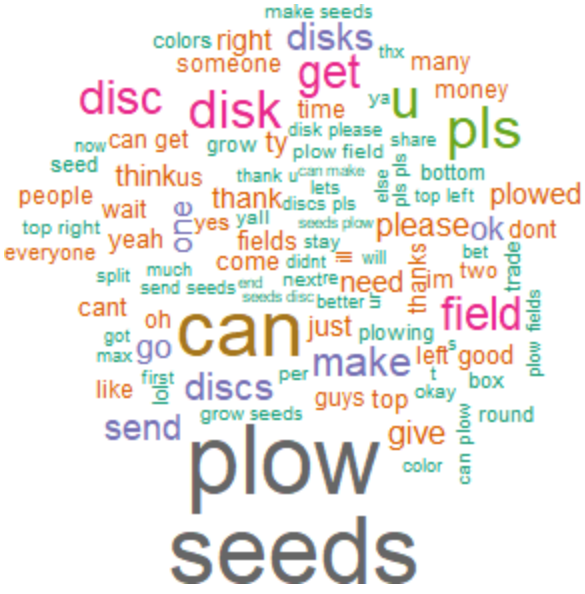
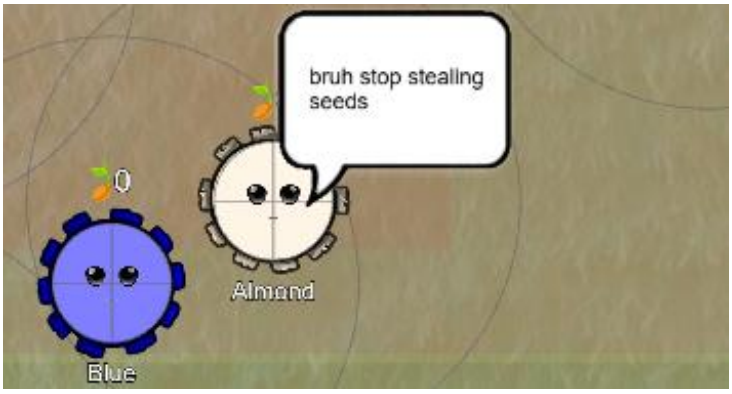



**Figure 11 NoFieldPR Wordcloud**

Comparing the three treatments in which one resource lacked protection (Figures 9-11) reveals stable patterns. Across groups, participants repeatedly invoke “plow,” “disc,” and “seeds.” A term that consistently describes disc distribution is “share.” Artists frequently promote mutual sharing, and in this small-group setting with high reputation value and automatically enforced attribution, they do not advocate maximal restriction on their work. As sessions progress, most groups recognize positive-sum opportunities and encourage one another to realize them.

In the *noSeedPR* word cloud (Figure 10), "steal" and "stealing" appear at medium prominence. Figure 12a illustrates a typical sequence in which participants discuss seed stealing; Figure 12b presents chat from the same period and session about discuss disc taking. In this example, artist Blue argues that "our pie pieces are basically infinite," implying that replicating discs imposes no harm because it deprives no one. Only 30 seconds earlier in the same session, farmer Almond had labeled seed taking as "stealing." The *noPR* treatment is designed precisely to enable such within-group comparisons of how participants perceive and articulate seed taking versus disc taking.

a. Discussing seed taking




b. Discussing disc taking

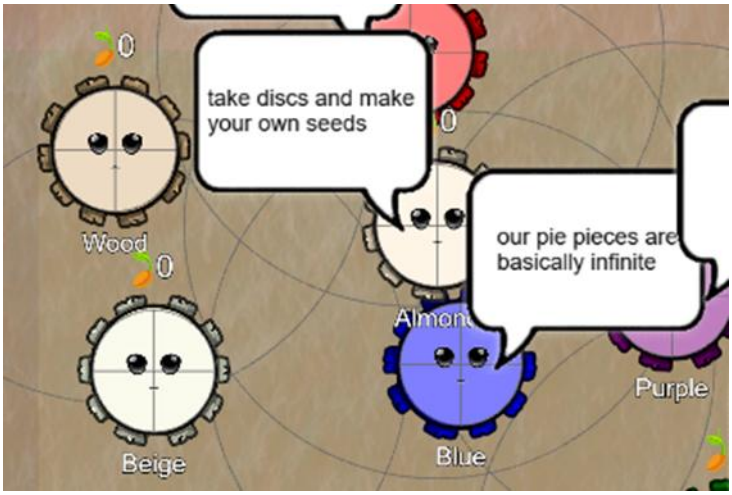



**Figure 12 Two discussions from the Period 5 Chat Break in noPR1**

Sustaining cooperation requires more than a single injunction of "thou shalt not steal." In Period 5 of *noPR1*, Almond instructs others to "stop stealing". Table 10 records a later exchange in the same group, several periods afterward, in which Wood again implores participants to "stop stealing."

**Table 9 Chat in noPR1**

| Period | Player | |
|---|---|---|
| 8 | Red | dont steal pls :( |
| 8 | Almond | two to a field in the end |
| 8 | Beige | ty |
| 9 | Green | two only |
| 9 | Almond | end with two in a field not more |
| 9 | Red | pmeone plow tghis field pls |
| 9 | Purple | hello |
| 10 | Red | we need to plow all fields |
| 10 | Wood | stop stealing |

Figure 8 shows that seed taking persists beyond the period-5 admonition in *noPR1*. The group eventually stops seed taking and becomes relatively high-earning, aided by extensive disc distribution (see Figure 4).

Qualitative context clarifies how participants evaluate resource types. Although debates about seed taking are most acrimonious, disputes also arise without seed taking. In period 3 of *noFieldPR1*, farmer Beige says, "we should get someone to plow this," signaling difficulty recruiting effort when creators feel exploited. In period 5 of the same session, farmer Wood explains, "cause too many [people] in one is worse," indicating that trespassers overcrowded a field, reduced its multiplier, and harmed the original farmer and the intended co-occupant.

In *noDiscPR2*, artist Purple urges, "blue build disc," highlighting that some artists do not incur the cost of producing discs when they can instead take discs without offering anything in return. Participants discuss discs often enough to reveal how they conceptualize the resource. In many instances, they articulate the positive-sum logic of zero-marginal-cost copying. For example, in Period 14 of *noPR8*, farmer Almond reasons, "ok so disks cant be stolen so everyone take copies," explicitly rejecting the application of "stolen" to discs.

Participants never instruct one another to stop taking disc copies, yet they frequently urge others to stop taking seeds. The objection targets the *taking away* of rivalrous goods, not the act of copying per se. As farmer Almond explains in *noSeedPR2*, "cuz if u give a disc u still keep it," emphasizing that artists can replicate discs at zero marginal cost.

**Result 5**: Participants do not attempt to discourage disc taking and explicitly state that "stealing" does not apply to discs because they are nonrivalrous.

Finally, the rule against seed theft does not emerge from moral idealism. Table 11 (Period 5 of *noSeedPR3*) illustrates that strict property norms for rivalrous goods also reflect straightforward economic reasoning.

**Table 10 Chat in noSeedPR3 Period 5**

| Period | Player | |
|---|---|---|
| 5 | Almond | next round NO ONE STEAL FROM EACH OTHER |
| 5 | Khaki | its not hard pls |
| 5 | Purple | what do we do |
| 5 | Khaki | i want money |
| 5 | Wood | alr no stealing |

## 5. Discussion and Conclusion

Our experiment extends a broader research program on the emergence of property as a moral convention in the laboratory (Wilson, 2015). Most prior experiments study environments with rivalrous goods that mirror property norms for physical goods (Kimbrough et al., 2008, 2010; Wilson et al., 2012; Jaworski and Wilson, 2013; Kaplan et al., 2018). That work supports our central claim: property norms rest on psychological and social foundations. Wilson (2020, 2023) argues that property is a custom grounded in harm avoidance and communal recognition of injury.[16] Even without explicit exogenous ("legal") prohibitions, people rapidly establish rules for possession, trade, and exclusion. In such settings, unauthorized taking reliably elicits moral condemnation and retaliation, consistent with evolutionarily deep intuitions about property. Intellectual property may resist enforcement precisely because these evolved instincts do not extend to nonrivalrous goods. Our study advances this research to a modern context in which nonrivalrous idea production occupies a central role in the information economy.

In an experiment focused solely on digital property, Buchanan and Wilson (2014) find that participants who never experience IP protection do not label unauthorized copying as "theft." Across 4,980 words in a treatment condition without IP protection, creators never once complain about piracy, nor describe reposting or remaking as "theft" or "stealing," nor propose compensation. Participants occasionally remark that "someone should make a really red color...," which acknowledges production needs without invoking property rights. Our data reproduce this "someone should" language for both disc production and field plowing.

Our evidence indicates that moral intuitions about property violations hinge on rivalry. In free-form laboratory chat, taking rivalrous goods provokes immediate moral condemnation and negative sentiment, whereas taking nonrivalrous goods is accepted or even encouraged. Participants explicitly state that "stealing" does not apply to discs because copying does not directly deprive any possessor of the good. This reasoning challenges legal frameworks and public campaigns that equate digital piracy with physical theft.

These findings carry important implications for IP policy in the digital age. Campaigns like "You Wouldn't Steal a Car" seek to construct moral equivalence between physical and digital taking, yet they run counter to widely held intuitions about harm. Attribution emerges as a potentially decisive margin. In our environment, creators retain visible credit even when others copy their work, a feature that appears to facilitate the cooperative sharing. In contrast, contemporary technologies increasingly enable copying, transformation, and remixing without attribution, as seen in debates over large language models (Korn & Trachtenberg, 2025). Moral objections may arise more readily when actors misappropriate authorship

[16] "Property is defined negatively by what people will *not* tolerate: injury." (Wilson, 2020, p. 84)

than when they replicate ideas. Future research should examine how group size, anonymity, and attribution systems shape property norms for nonrivalrous goods.

The persistent absence of moral condemnation for nonrivalrous taking, even under conditions designed to render such taking salient, suggests limits to extending physical-property intuitions to intellectual property. As economies rely more heavily on idea creation and digital goods, institutional design should align these psychological foundations. Rather than forcing digital goods into conventional property regimes, policy might pivot toward mechanisms—such as patronage, subscription, or prize systems—that better match moral intuitions about goods that can be shared without loss while still incentivizing innovation.

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# Appendix

Experimental Instructions

Instructions for session: Four Disc, Four Field, No Disc PR #7

Person: Red

**Welcome**

This is an experiment in the economics of decision-making. The instructions are simple; if you follow them carefully and make good decisions, you can earn a considerable amount of money that will be paid to you privately at the end of the experiment.

In this experiment, your name is **Red**. The gear-shaped avatar in the center of your screen represents you.

You and the other 7 people each control an avatar that can do some but not all of the following: grow seeds, build discs, plow fields, and interact with avatars controlled by others. Your avatar's resources and how you interact with others determine your earnings each period.

Try navigating the environment now by left-clicking  on the screen. Do this now.

Continue to the next page of the instructions by pressing the Next button.

**Production**

You begin each day with 16 seconds that you can allocate to production. There are two ways to use your production time. You can grow seeds and build a disc. Your remaining production time is displayed at the bottom of your screen.

Try building a disc now by clicking the Build Disc button at the bottom left of your screen. Do this now. Building a disc uses 10 seconds of production time. While your avatar is building a disc, it is frozen and cannot engage in other activities until the production is complete. Once the disc is built, it will appear in your inventory and be displayed in the top right area of your screen. The pie-shaped wedges on your avatar display your disc inventory to others in the experiment. Discs are color-coded based on the avatar that produced them. An avatar can produce at most one disc per period.

Each disc in your inventory is worth 18¢ at the end of the period. The disc inventory is reset each period.

Continue to the next page of the instructions by pressing the Next button.

**Production Continued**

In addition to building discs, you can devote some of your production time to growing seeds. Try growing **10** seeds at once using the Grow Seeds button in the bottom left of your screen. Do this now. Growing a seed uses 0.5 seconds of production per seed. While your avatar is growing seeds, it is frozen and cannot engage in other activities until the production is complete. Once the seeds are grown, they will appear in your inventory and be displayed in the top right area of your screen. The seed counter above your avatar shows your seed inventory to others in the experiment.

Each seed in your inventory is worth 1¢ at the end of each period. The seed inventory is reset each period.

Continue to the next page of the instructions by pressing the Next button.

**Production Continued**

Others can plow a field, but you cannot. A field turns the color of the avatar who has plowed it. An avatar can plow at most one field per period. A plowed field gives you the opportunity to multiply the cash value of your seeds. Plowing a field uses 10 seconds of production.

Avatars can enter a field after it is plowed. A plowed field multiplies the earnings from every seed for every avatar inside the field. Notice that the multiplier changes as the number of avatars in the field changes. All avatars in a field receive the same multiplier. An avatar must be in the field at the end of the period to receive the multiplied earnings for its seeds. The seed multiplier that your avatar is currently receiving is displayed in the top right of your screen.

All fields have the same multiplier schedule and are reset to unplowed each period.

If an avatar can build a disc, it cannot plow a field, and vice-versa.

Avatars must complete their production (building discs, growing seeds, and plowing fields) before the time remaining in the period reaches 40 seconds.

Continue to the next page of the instructions by pressing the Next button.

**Interactions**

You can move seeds and discs between your avatar and other avatars. Walk over to another avatar and right-click  on it.

Click Send seeds to ... then send them **2** seeds. Do this now. Notice that your seed inventory decreases by 2, and theirs increases by 2.

Using the same interaction menu, you can send others a copy of the discs in your inventory. Each avatar can possess, at most, one copy of each disc. Each disc copy you have is displayed in your inventory and is worth 18¢.

Continue to the next page of the instructions by pressing the Next button.

**Chat**

You can chat with other nearby avatars using the chat box at the *bottom* of your screen. Do this now.

You are free to discuss any aspects of the experiment, with the following exceptions: you may not reveal your name, discuss side payments outside the laboratory, or engage in inappropriate language (including such shorthand as 'WTF'). If you do, you will be excused and forgo your experiment earnings.

A period lasts 100 seconds. Every 5 periods has an additional 50-second break phase, where chatting is enabled, but all other interactions are disabled.

Continue to the next page of the instructions by pressing the Next button.

**Conclusion**

Many of the interaction menus have a help button that you can use to reference the instructions during the experiment.

This is the end of the instructions. If you have any questions, please raise your hand, and a monitor will come by to answer them. If you are finished with the instructions, please click the Start button located in the bottom right of this frame. The instructions will remain on your screen until the experiment begins. *We need everyone to click the* Start *button before we can begin the experiment.*