Getting a Leg Up or Pulling it Down? Interpersonal Comparisons and Destructive Actions: Experimental Evidence from Bolivia

Eliana Zeballos PhDc.

Agricultural and Resource Economics
University of California Davis
eliana.zeballos@gmail.com

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Eliana Zeballos *

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Abstract

Sometimes people, when comparing themselves with others, take a host of actions that are destructive to those around them, even when these actions imply self-inflicted costs. "Pulling down" other more successful individuals may have both direct and indirect detrimental effects on productivity and efficiency. On one hand, welfare is reduced directly as output is destroyed, and indirectly if their threat induces ex-ante behavioral responses in the form of lower levels of effort and investment.

Consequently, linking reactions to upward social comparisons and their effect on effort levels may help explain the considerable variability in how people have been shown to react to such comparisons. In this paper, I develop a two-stage, two-agent model of strategic behavior that integrates the role of inter-personal comparisons with conventional neoclassical economic preference theory to analyze how interpersonal comparisons lead to destructive behavior and affect levels of effort. The experiment, designed to test the predictions of the model and tease out the mechanisms that drive destructive behavior, builds on the two-stage "money burning" game.

The experimental games were carried out in Bolivia among 285 dairy farmers. Results show that people that were above the within-group mean, in average exert less effort when comparing themselves with others (the "guilt" case); while people below the within-group mean exert more effort (the "keep-up-with-the-Joneses" case). People who fear the envy of others decrease their effort exerted, specially if they are highly ranked. Results from the money burning game show that people below the mean took in average more destructive behavior than people above the mean. Of all the participants, 55% took at least one destructive action against somebody in their group reducing their output by 34%. People seem to be averse to disadvantageous inequalities, but not averse to advantageous inequalities. Moreover, people destroy less the bigger the advantageous difference is but destroy more in the oposite case.

*PhD Candidate, Agricultural and Resource Economics - University of California Davis

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"Envy is the great leveler: if it cannot level things up, it will level them down" Dorothy Sayers

1 Introduction

Couple of years ago, *Delizia* (an ice-cream factory that works with approximately 2,700 dairy farmers in Bolivia) implemented a bonus mechanism to increase the percentage of milk fat. Increasing percentage of milk fat requires a series of feeding procedures [1]and to remunerate this extra effort, *Delizia* planned to pay dairy farmer 5% extra per kilo of milk with a higher concentration of milk fat. Since the government controls the price of milk in Bolivia, and *Delizia*'s demand of milk is not fully satisfied, nobody could have been negatively affected by this incentive. However, *Delizia* encountered massive protest of dairy farmers with the argument that everybody should receive the same price and that they didn't like this "price discrimination". As a result, Delizia removed this bonus mechanism and dairy farmers that invested more effort to increase percentage of milk fat were negatively affected by the actions of others.

Why did dairy farmers complain? Conventional microeconomic theory predicts that narrowly self-interested individuals will exert effort until they maximize their utility. Specifically, if the bonus compensates the marginal cost of increasing milk fat, dairy farmers will exert more effort. In case this extra income does not compensate the extra cost, dairy farmers will not exert extra effort. Therefore, there is no room for destructive behavior, specially if it is costly. However, if individuals not only care about their absolute earnings but also care about their relative economic position, destructive behavior is possible. In particular, an individual will suffer from others' success if his relative earnings are lower.

Consequently, linking reactions to upward social comparisons and their effect on effort levels may help explain the considerable variability in how people have been shown to react to such comparisons. On one hand, upward interpersonal comparisons can lead to a moving-up motivation in the form of exerting more effort, that implies incurring a cost, in order to improve the position relative to others who are ahead (i.e., the keep-up-with-the-Joneses effect). On the other hand, such comparisons can led to a puling down motivation in the form of destructive actions even it these actions imply self-inflicted costs. Then, when an individual gets disutility from earning less than others around, will he invest greater effort to "catch up" with others? Or will he take a destructive action against the most advanced ones to "pull them down"?

When individuals take actions to pull down other more successful individuals, thus deterring them from taking actions that would lead towards further success, may have both direct and indirect detrimental effects on productivity and efficiency. On one hand, destructive behavior directly reduces welfare and it may also reduce output and welfare indirectly if their threat induces ex-ante behavioral responses in the form of lower levels of effort and investment. While some literature acknowledges the possible effects of destructive actions on effort and investment [11] [27] [32], I am unaware of any theoretical and empirical evidence on the direct and indirect effects of destructive behavior. This paper fills this gap.

The theoretical model developed in this paper is a two-stage two-agent model of strategic behavior that integrates the role of inter-personal comparisons with conventional neoclassical economic preference theory to analyze how interpersonal comparisons lead to destructive behavior and affects levels of effort and the experimental game is designed to test the predictions of the model.

Moreover, understanding the motivations underlying destructive behavior is crucial to improve the design of public and private policies and programs where destructive actions may exist. Some relevant

[1]In order to increase the percentage of milk fat, dairy farmers need a proper ration formulation, maximum feed intake, monitor dietary composition, harvest and/or buying high-quality forage and proper forage allocation, and properly feeding protein, energy, fiber, minerals and vitamins [19].

contexts include workplaces, communities, and cooperatives characterized by close interactions among individuals, homogeneity in activities, and heterogeneous and observable outcomes. However, very little empirical work has been done on the motivations behind destructive behavior [27] [20]. This points toward the need to set up experiments that allow to discriminate between the mechanisms that drive destructive behavior. The experimental design that I develop in this paper, builds on the two-stage "money burning" game of Zizzo and Owald (2001)[2] with two important modifications. First, I replace the random generation of participants' earnings with a simple effort task in the first stage; specifically, earnings depend on the number of beans individuals separate from a container full of beans and rice. Second, individuals participate in different activities that present alternative scenarios that vary the incentives to "burn money" in the second stage. The results from the experimental game not only test the predictions of the model, but they also tease out the mechanisms behind destructive behavior.

The next section introduces the main findings in the literature. I first present how interpersonal comparisons can lead to changes in effort levels and how they can result in destructive actions; and then I introduce the main concepts and findings of three mechanisms that could be driving destructive behavior: envy, inequity aversion, and inequality aversion. Section 3 presents the theoretical model of behavior where effort levels and destructive actions are related to other's gains; and based on this model, I discuss how interpersonal comparisons and the possibility of destructive behavior affect levels of effort. Section 4 introduces the main research questions and hypotheses with predictions from the theoretical model. The experimental protocol is described in section 5 and Section 6 presents the results. Finally, section 7 concludes.

[2]The money burning game has two stages: a betting stage and a burning stage. The "betting" stage introduces random variation in participants' earnings, while the "burning" stage allows participants to alter this distribution by engaging in "money burning" whereby subjects can pay to reduce others' earnings [53].

2 Literature Review

Conventional economics views individuals as narrowly self-interested and rational actors who are concerned only with their own needs and desires and this implies that others' outcomes neither have a direct impact on, nor play an instrumental role in, an individual's own welfare or actions. Nonetheless, the assumption that preferences are independent across individuals and that individuals act only out of concern for their own self-interest has been questioned by many economist and many studies have established that individuals not only care about their absolute economic position but they also care about their relative economic position [12] [30], act on considerations of reciprocity [13], fairness [14] [13], and altruism [36].

2.1 Interpersonal Comparisons and Positional Concerns

The importance of relative position has a long history in economic theory. Veblen (1899) introduced the concept "conspicuous consumption" and "conspicuous leisure" that emphasize the importance of actions designed to display one's relative position in society such as the of silver flatware at meals to display a higher social-status [47]. Duesenberry (1949) used the idea of the "demonstration effect" to explain how a family's consumption is influenced by the purchases of its neighbors and it promotes unhappiness with current levels of consumption [9]. More recently, Bannerjee (1990) stated that the pleasure that some people get out of a particular consumption will be less if they feel that everybody around them has more than they have [2].

Then, if an individual derives utility not only from her own level of consumption but also from other individuals' levels of consumption when making interpersonal comparisons (i.e., positional or relative concerns) [1] [12] [47] [9] [30] [35] [37], one person's increase in consumption has a negative externality on others because it lowers their relative consumption [30] [2]. This, may explain the protests of dairy farmers that *Delizia* encountered.

Empirical evidence shows that feeling good in society is typically more affected by the relative positions than by absolute wealth [42] [35] [37] [12]. For instance, Luttmer (2005) finds that higher earnings of neighbors are associated with lower levels of self-reported happiness [30]. Fafchamps and Shilpi (2008) use data from Nepal to test if poorer and more isolated individuals care less about relative consumption and find that this is not the case. Moreover, they find that Nepalese households' subjective welfare increases with their own consumption and falls with the average consumption of neighbors. On the contrary, Ravallion and Lokshin (2005) use survey data from Malawi to show that there are positive externalities from economic gains to friends and neighbors for poor people [37].

Positional concerns can explain many real world phenomena and they may be completely rational [15]. If people constantly compare themselves with their environment and care greatly about their relative position, this may influence individuals choices [43]. Consequently, interpersonal comparisons can lead to different actions and affect behavior.

For instance, interpersonal comparisons can affect decisiones regarding where to work. Frank (1985) found that a person who cares greatly about relative status works for less in a firm where his income is relatively higher in that firm [15]. Solnick and Hemenway (1998) show that half of their respondents said they would prefer a world in which they have 50 percent less real income, so long as they have high relative income [24]. Tversky and Griffin (1991) carried a similar experiment and find that 84% of the respondents prefer to work at a place where they have a higher absolute salary and lower relative position, but that 62% believe to have higher satisfaction in the job with the lower absolute salary and higher relative position [44]. Johansson-Stenman et al. (2002) found that most of the individuals in their sample were willing to trade off a non-negligible amount of money for increasing their grandchild's

relative standing in the society [26].

Interpersonal comparisons can also affect levels of effort and investment. Torgler, Schmidt, and Frey (2006) show that if a soccer player's salary is below the average and this difference increases, his performance worsens and the productivity decreasing effects of positional concerns are stronger [43]. Similarly, Frey, Schaffner, Schmidt and Torgler (2013) find considerable support for the idea that a relative income disadvantage is correlated with a decrease in individual performance [17]. Kebede and Zizzo (2011) look at how destructive behavior can affect agricultural innovations and conclude that: 1) individual's destructive behavior likely captures relevant individual characteristics correlated to innovation behavior; and 2) destructive behavior of others is also expected to affect individual innovation behavior [27]. Hoover and Kimbrough (2014) find evidence that when information is available about others past decisions, this generates differences in behavior between individuals of different initial incomes, but not in those of different initial wealth. Low-income individuals are substantially less likely to invest than high-income individuals despite the fact that investment by all types leads to the same increase in expected utility. They also find evidence that interpersonal comparisons increases the rate of suboptimal investment choices among the poor [23].

Interpersonal comparisons can affect contributions, cooperation, and risk taking behavior. Fafchamps and Shilpi (2008) found that concerns for relative consumption affect voluntary contributions to public goods [12]. Parks et al. (2002) show that, after knowing others' outcomes, people whose outcomes were of a lesser magnitude than the opponent being uncooperative and people with greater-magnitude outcomes being very cooperative [33]. Hill and Buss (2010) explore the role that concerns with relative position play on preferences for certain versus probabilistic outcomes and predict that concerns with relative position will lead to increased risk [22].

To summarize, accumulating research in sociology, anthropology, social psychology and economics shows that the welfare of individuals is affected not only by the absolute amount of resources at their command but also by their relative position vis-a-vis others they compare themselves with [27].

Next, I will present some finding in the literature that link interpersonal comparisons and destructive behavior and the possible underlying mechanism they may be driving destructive actions. Given that the resulting behavior from interpersonal comparisons has been related to envy [29] [10], and since it plays a crucial role through social comparisons [31], the next subsection presents some of the most relevant literature related to envy.

2.2 Envy

"Envy is the painful emotion caused by the good fortune of others" Aristotle

Envy may be defined as a pattern of thoughts, emotions, and social behaviors that results from the perceived loss of social standing in response to another obtaining outcomes that are personally desired [48]. However, envy and its implied suffering is not the envier's mere lack of that good, but his perceived inferiority to the envied [31] when interpersonal comparisons take place. Then, envy is an emotion that results from a loss of self-esteem that arises when one compares themselves to others and he lacks another's superior quality, achievement, or possession, and either desires it or wishes that the other lacks it as a result of feeling of resentment and inferiority [34] [31] [8].

Envy is good or bad based on the outcomes it produces [52]. Van de Ven et al. (2009) and Grolleau et al (2006) distinguish between two types of envy: 1) white envy that leads to a moving-up motivation and it is characterized by individuals willing to incur a cost in order to improve one's own position relative to others who are ahead of them; and 2) black or malicious envy that leads to a pulling-down motivation and it is characterized by individuals willing to incur a cost in order to push the other reference individual downwards [45] [20].

On one hand, (white) envy can be seen as a motivational force that prowls people to work harder (i.e., the keep-up-with-the-Joneses effect) to get what others already have [16] and this may spurs economic growth. For instance, some argue that income differences lead to better performance, as they raise the incentive to achieve a similar status [43]. If lower income individuals are "keeping-up-with-the-Joneses", they may try to mimic patterns of consumption observed in higher income individuals, and increase efforts towards human capital enhancement [23]. Then, if a large positional difference induces individuals to try to achieve a higher position, it will raise performance [43].

On the other hand, (black) envy has been regarded as one of the most widespread emotions and also a particularly bad one, because it is both very unpleasant and very reprehensible [31]. This type of envy is generally frowned upon [39] and it is "one of the most universal and deep-seated of human passions" [38]. Schoeck points out that not only the fact that too much envy is bad, but more importantly the fact that without envy society would be impossible, which is paradoxical [39].

Black envy may have serious implications for a number of areas of interests to economists, such as bargaining, human welfare, firm structure, interindustry wage differentials, consumption and taxation and economic growth [52]. For instance, envy is found to promote irrational decision - making [3] and to hinder cooperation [33]. Innovation may be also discouraged out of fear of negative reaction from others [27] [32].

According to Miceli and Castelfranchi there are at least 5 components necessary for feeling (black) envy: a) one's unfavorable comparison with another as regards to a certain goal or class of goals; b) one's suffering because of this sense of inferiority and the implied loss of self-esteem or utility; c) one's feelings of helplessness and hopelessness with regard to overcoming one's own inferiority (i.e., it feels that it is impossible to "keep-up-with-the-Joneses"); d) one's ill will towards the advantaged party, which implies e) one's ultimate goal or wish that the advantaged party should not achieve her goal [31] (i.e., destructive action).

The social costs of accumulating wealth can be large and evidence shows that people abstain from behavior that would provoke the "envy" of others [11] and as a result, individuals may be discouraged from engaging in riskier actions, such as adopting new technologies, or entrepreneurship (i.e., increase effort). Moreover, individuals may be afraid to engage or hide their successes in productive economic activity for fear of social backlash and retaliation [20]. Schoeck (1969) proposed that the fear of being envied prevents people from striving for excellence, thereby hindering the progress of societies as a whole [39]. On the other hand, the fear of being envied may provoke more successful individuals to share their earned income with others [25] that may not be necessarily motivated by altruism of inequality aversion.

Operationally, an envious person would prefer that others have less or suffer some bad, and he might even sacrifice a little of his wealth to achieve that end [49] [31]. In other words, an envious person increases his utility by destroying some of the others' assets, even if such action carries its own costs [43] [17]. For instance, Zizzo (2001) runs an experiment where people can "burn" other subjects' money at their own cost and finds that about two thirds of the subjects spend their money to hurt other people [53], which contradicts mainstream economics that predicts that if you were given a choice to spend your earned money to eliminate money of other people, with no chance of getting a profit sometime in the further out of it, there is no way you would do it [52].

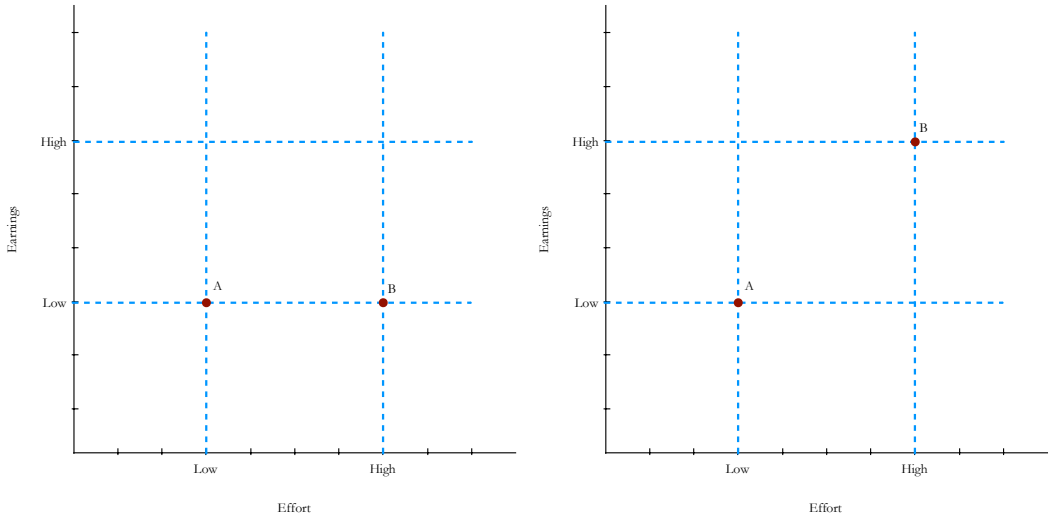
In general, as stressed by Dogan and Vecchio (2001), behaviors resulting from envious emotions are often dysfunctional in nature and induce direct costs (time and energy expended by the resentful individual) and indirect costs (unpleasant consequences such as retaliation, loss of reputation, emotional costs) [8].

Although envy appears to be the most important motivation behind interpersonal-comparison-based destructive actions, there may be other related social preferences (such as fairness considerations,

reciprocity and inequality aversion) which under some range may operate equivalently in terms of a negative weight places on the consumption of other agents [27], however, there is an important conceptual difference between them. In particular, the next subsections focus on inequality aversion and inequity aversion.

2.3 Inequity Aversion and Inequality Aversion

Before proceeding, it is important to clarify that there is a fundamental difference between aversion to inequity and aversion to inequality. Inequity is a synonym of unfairness and implies conditional differences whereas and inequality is lack of equality and it implies unconditional differences. For example, as Figure 1 shows, if individual A exerts less effort than individual B and both earn the same amount, the final payoffs are equal but this situation may be considered unfair. Alternatively, if individual B exerts more effort than individual A and therefore individual B earns more than individual A, the final payoffs are unequal but the situation may be considered fair.



(a) Inequity (b) Inequality

Figure 1: Inequality vs. Inequity. Panel (a): equality in earnings, unfair scenario as individual B exerts more effort than individual A and both are paid the same. Panel (b): inequality in earnings, fair scenario as earnings vary with effort exerted.

Therefore, if we only observe differences in outcomes but not the mechanisms behind these differences, it will be difficult to differentiate between inequity and inequality. Thus, it is important to state the conditionality behind outcomes, which in both the theoretical model and behavioral experiments in this paper is the level of effort and initial conditions.

2.3.1 Envy and Inequity Aversion

Inequity aversion is the preference for fairness or the resistance to inequitable outcomes [14]. On the other hand, self-centered inequity aversion is a situation where people do not care per se about inequity that exists among other people but are only interested in the fairness of their own material payoff relative to the payoff of others, which is the interest of this paper. In particular, when the person is not able to keep up with the more advanced ones, this may lead to frustration, resignation, and even shame. Such individuals may feel it is impossible to "keep-up-with-the-Joneses" and give up trying to reach them [17] [43]. In this situation, envy can be characterized by feelings of inferiority but also

subjective injustice [34], or "self-centered unfairness". Then, the "why her and not me" attitude of envy may actually imply a component of perceived unfairness [31].

Moreover, there is a rich tradition of scholarly work that suggests that envy also involves a sense that the envied person's advantage is undeserved. Therefore, one may argue that envy can occur only if we are unable to show that the other person's advantage is unfairly obtained. Smith et al. (1994) show that envy, especially in its typically hostile form, may need to be understood as resulting in part form a subjective, yet robust, sense of injustice. Hostile feelings are associated with a subjective belief that the envy-producing difference is unfair and that depressive feelings are associated with a sense of inferiority evoked by the envied person's advantage [41].

The sense of injustice in envy may help explain why envy involves hostility and dislike. It is natural to feel hostility if someone has an undeserved advantage, even if the claim of injustice must remain a private grievance because it lacks social validation [40]. Since it remains utterly unfair (even subjectively) to (wish to) restore "justice" through some evil act against the innocent people who benefit from their advantages [31]. However, people appear quite capable of believing privately that an advantage "seems unfair" even though others might object to this belief.

But, when are we in a "fair" situation? Varian (1974) posits that each individual compares his own bundle to the bundle of each of the other individuals and defines a fair allocation as one in which individuals are indifferent to each other's bundles [46]. Rabin (1993) defines a fairness equilibrium as the set of outcomes reflecting motivations such as those where people want to be nice to those who treat them fairly and want to punish those who hurt them [36]. In this paper, I assume a situation to be "fair" when individuals have equal endowments and working conditions to generate outcome. Then, the only difference in income will be a result of different levels of effort exerted.

There are two well-known economic experiments that have been used to measure fairness: 1) the dictator game, where the "dictator" chooses how to split some amount of money between himself and another subject; and 2) the ultimatum game, which is an extension of the dictator game where the recipient is allowed to veto the entire deal if he/she feels that the dictator was not "fair". These experiments show that when low offers are made, the recipient punishes the dictator by vetoing the deal deviating from the sub-game perfect equilibrium in systematic ways. In particular, in the ultimatum game, low offers are frequently rejected suggesting that fairness norms are enforced [7].

Another relevant experiment to measure fairness is the third party punishment game (3PPG). In the 3PPG two players are allotted a sum of real money and a third player gets one-half of this amount. Player 1 must decide how much of the stake to give to player 2 (who makes no decisions). Then, before hearing the actual amount player 1 allocated to player 2, player 3 has to decide whether to pay 10% of the stake (20% of his or her allocation) to punish player 1, causing player 1 to suffer a deduction of 30% of the stake from the amount kept. Player 3's punishment strategy is elicited for all possible offers by player 1 [21].

2.3.2 Envy and Inequality Aversion

Varian (1974) posits that each individual compares his own bundle to the bundle of each of the other individuals and states that if, in a given allocation, agent i prefers the bundle of agent j to his own, he says that i envies j. Then, if there are no envious agents at a given allocation, the situation is equitable. Moreover, if this allocation is both equitable and pareto efficient, this allocation is considered fair.

While envy seems to be related to a sense of unfairness and include the desire to eliminate inequality, Ben-Ze'ev (1992) concludes that envy differs from the egalitarian moral concern in two ways: it involves a partial rather than a general concern for equality; and envy may exist even when equality is unachievable and has nothing to do with egalitarian moral principle [4].

For instance, Zizzo (2002) runs an experiment where people can "burn" other subjects' money and finds that about 50% of the subjects engage in destructive actions (i.e., money burning). He notices that this "money burning" behavior is not necessarily out of envy, it could be because individuals are inequality averse. Three subjects out of four appear rank egalitarian [3] providing support to theories that predict that individuals care about how money is divided among other individuals [50].

Two well known models that have been used to formalize inequality aversion are the models of Fehr and Schmidt (1999) that posits that individuals dislike advantageous inequalities (guilt) and disadvantageous inequalities (envy) (i.e., individuals focus on absolute differences) [14]; and the model of Bolton and Ockenfels (2000) that focuses on the relative position of the individual compared to the mean payoff of other players [5]. Both models are tested in section 6.

To sum up, several studies have shown that, when individuals make interpersonal comparisons they may not only derive utility from their own levels of consumption but also from others' levels of consumption. As a consequence, individuals may engage in a host of behaviors that are destructive to themselves and those around them. Differences in outcomes may provoke an individual to feel relatively deprived. This feeling may be manifested as envy, self-centered fairness, and inequality aversion, which are the focus of this paper. Figure 2 summarizes the idea behind envy, self-centered fairness and inequality aversion.

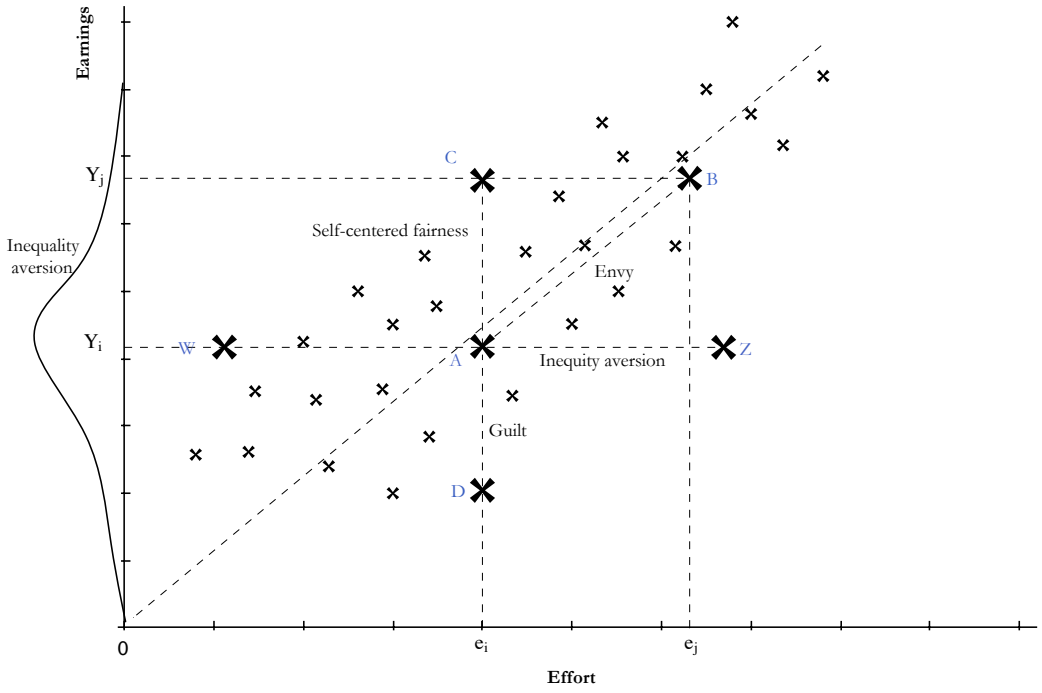


Figure 2: Envy, Equality and Fairness. Each X represents outcome Y_i for a level of effort e_i. An individual located at point A may envy B, may feel a one-to-one sense of unfairness with respect to C, or may feel guilt with respect to D if he dislikes being above others. Individual i may also experience disutility when looking at the unconditional distribution of outcomes if he is averse to inequality, or may experience disutility when considering individuals located at points Z and W if he has a general sense of inequity aversion.

[3] Zizzo (2002) considers an individual as satisfying a rank egalitarian relationship if the individual in the experiment reduces the outcome of the richest of the other individuals at least as much as or more than the second richest, and that of the second richest at least as much or more than that of the poorest individual

where each X represents outcome Y_i for a level of effort e_i. Outcome, as it will be better analyzed in the next section, will depend on initial endowments, ability, and effort. Then difference in outcomes will be a result of changes in one of these parameters. As described before, a "fair" scenario is that where endowments and working conditions to generate outcome are the same. Then, under a fair scenario, individual i located at point A may be envious of individual j located at point B. In a second scenario where both have same levels of effort but one has a higher outcome due to endowment inequalities (unfair scenario), individual i located at A may feel a one-to-one sense of unfairness, which I've been referring to as self-centered fairness, with respect to individual j located at point C; or he may feel guilt with respect to individual j located at D if he dislikes being above others. Moreover, if he is averse to inequality, he may experience disutility when looking at the unconditional distribution of outcomes. Finally, individual i may also experience disutility when considering points Z and W if he is inequity averse. These possible mechanisms behind destructive behavior are tested in the experimental games.

3 Theoretical Model

This section presents a microeconomic model of behavior that allows for positional concerns and destructive actions in order to analyze how they affect effort level decisions and understand the reasoning behind actions taken to punish others within the reference group, even when these actions are costly.

One way of modeling positional concerns is by adding the consumption of the other agent(s) in one's own utility function (i.e., $U^i(C_i, C_j)$). Then, agent i's utility does not depend solely on his own consumption, but also on his relative consumption with respect to agent j.

On one hand, if agent i's consumption level is lower than agent j's consumption and agent i is concerned with his relative position, there is a disutility generated from agent j's superiority[4]. On the other hand, similar to Fehr and Schmidt (1999), agent i's utility may not only be affected by a material disadvantage (i.e., $C_i < C_j$), but also from a material advantage (i.e., $C_i > C_j$). Then, if the agent i's consumption is higher than agent j's consumption, agent i may suffer disutility generated from his superiority (the "guilt" case when he is averse to inequality), or agent i can gain utility if he enjoys being ahead of others (the "status seeking" case [15]).

3.1 A 2-Agent Model of Behavior

Consider 2 homogenous agents that are exogenously paired [5]. Let the utility of individual i be equal to $U_i(C_i, e_i, C_j; \theta_i^a, \theta_i^b)$ which depends on own consumption C_i, effort e_i, and on individual j's level of consumption C_j using the following utility function:

$$U^i = C_i - \theta_i^a \max[C_j - C_i, 0] - \theta_i^b \max[C_i - C_j, 0] - e_i^\rho, \quad \forall i \neq j \tag{1}$$

where $\rho > 1$ (i.e., exerting effort decreases utility at a decreasing rate) and U^i directly increases in own consumption C_i. The impact of interpersonal comparisons on utility depends on two factors:

1. The sign of $C_i - C_j$ (i.e., whether agent i's consumption level is higher or lower than agent j's consumption level)
2. The sign and magnitude of the positional concern parameters θ_i^a and θ_i^b.

[4]The disutility generated from the positive difference between C_j and C_i can be thought as inequity aversion/ inequality aversion [14], or envy [32] [46].

[5]As Fehr and Schmidt (1999) explain, the determination of the relevant reference group is an empirical question. Since in this paper I look at individuals behavior in economic experiments, where individuals enter the laboratory as equals, they are assigned to groups randomly, and identity of the members are kept anonymous at all times and therefore they do not know anything about who they are playing with, the assumption that the reference group is simply the set of subjects playing against each other that is exogenously formed is appropriate in this case. However, it would be important to consider the formation of reference groups outside laboratory settings since the social context and the social proximity among individuals are likely to influence reference groups and outcomes.

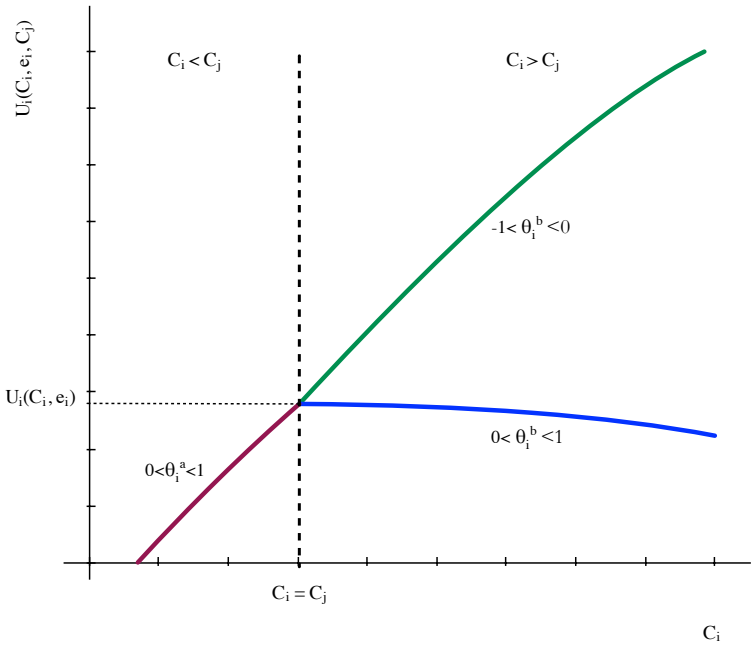


Figure 3: Utility Function. When $C_i < C_j$, U^i is decreasing in the difference between agents j' consumption and own consumption valued at θ_i^a. When $C_i > C_j$, U^i decreases in the difference between own consumption and agent j's consumption if θ_i^b is positive (the guilt case), and U^i increases in the difference between own consumption and agent j's consumption when θ_i^b is negative (the status seeking case).

Figure 3 shows three different ways in which utility of agent i can be affected by his relative position[6]. First, when the consumption of agent i is lower than the consumption of agent j ($C_i < C_j$), U^i is decreasing in the difference between agents j' consumption and own consumption. Agent i values this difference at θ_i^a that is bounded between 0 (i.e., agent i dislikes being behind others) and 1 (i.e., agent i values his relative position no more than his direct consumption). The MRS_{ji} between agent j and i's consumption is equal to $\frac{\theta_i^a}{1+\theta_i^a}$ (i.e., when the consumption of agent j increases by one unit, agent i should increase his consumption by $\frac{\theta_i^a}{1+\theta_i^a}$ in order to maintain the same utility level). Then, the larger is θ_i^a, the greater is the positional concern of being behind and the steeper the indifference curve is reflected in a larger MRS_{ji}. Note that when agent i increases his consumption level, keeping everything else constant, he generates utility directly from more consumption, and indirectly from "closing the gap" between agent j's and his own consumption level.

Second, when agent i's consumption level is higher than the consumption of agent j ($C_i > C_j$), U^i will decrease or increase in the difference between his own consumption and agent j's consumption depending on how he values being above others that is captured by the parameter θ_i^b. On one hand, U^i decreases in the difference between own consumption and agent j's consumption if θ_i^b is positive (i.e., agent i dislikes being ahead of others - the guilt case). θ_i^b is also bounded between 0 and 1 (i.e., agent i dislikes being ahead of others but he values his relative position no more than his direct consumption). The MRS_{ji} between agent j and i's consumption is equal to $-\frac{\theta_i^b}{1-\theta_i^a}$ which will be always be negative (i.e., when the consumption of agent j increases by one unit, agent i should decrease his consumption by $\frac{\theta_i^b}{1-\theta_i^b}$ in order to maintain the same utility level).

Finally, U^i increases in the difference between own consumption and agent j's consumption when θ_i^b

[6]The concavity in the utility is given by ρ. In order to increase C_i, e_i also has to increase and the cost of effort increases at a decreasing rate. This will be explained in detail in subsection 3.1.1

is negative (i.e., agent i enjoys being ahead of others - the status seeking case). θ_i^b is bounded between -1 and 0 (i.e., agent i likes being ahead of others but he values his relative position no more than his direct consumption). The MRS_{ji} between agent j and i's consumption is also equal to $-\frac{\theta_i^b}{1-\theta_i^a}$ but in this case is always positive (i.e., when the consumption of agent j increases by one unit, agent i increases his consumption by $\frac{\theta_i^b}{1-\theta_i^b}$ in order to maintain the same utility level).

Note that MRS_{ji} is always constant and therefore the marginal utility of "closing the gap" is constant when $C_i < C_j$ or when $C_i > C_j$ and $\theta_i^b > 0$; similarly, the marginal utility of "opening the gab" is positive and constant when $C_i > C_j$ and $\theta_i^b < 0$.

The assumption that the utility function is linear in C_i and in relative concerns (i.e., marginal rate of substitution between agent i' consumption and agent j's consumption is constant) may not be realistic, but, as Fehr and Schmidt (1999) show, many experimental observations that seem to contradict each other can be explained on the basis of this very simple utility function.

Moreover, this utility is consistent with the way envy is modeled in the literature, which states that agent i places a negative weight on the consumption of agents j when agent j is richer than agent i; this utility has also been interpreted as a form of inequality aversion [36] [14], although there is an important conceptual difference between them. On one hand, envy only focuses on upward comparisons (i.e., there is a negative utility from being behind others even under a "fair situation"[7]), whereas inequality aversion does not (i.e., agent i dislikes difference in outcomes regardless if he is above or below). Moreover, agent i can also suffer from the difference between his own consumption and agent j's consumption level if this difference is perceived as unfair and agent i is inequity averse.

Agent i's consumption C_i is a direct function of output Y_i and destructive behavior between agents that I will explain in detail in the next subsections.

3.1.1 Production of output

Agents produce output according to the following linear technology:

$$Y_i = F(K_i, e_i; \beta_i) = K_i e_i \beta_i,$$

where $0 \leq e_i \leq 1$; β_i represents agent i's production efficiency and K_i is equal to their initial endowment.

Agents can differ in the amount of initial endowment $K_i, i = 1, 2$, where $K_i = \lambda_i K$, K is the total endowment in the economy, and the vector $\underline{\lambda}$ captures the degree of initial inequality with $0 \leq \lambda_i \leq 1$ $\forall i$ and $\sum_{i=1}^{2} \lambda_i = 1$. Under a "fair" scenario agents will have equal endowments (i.e., $\lambda_i = 0.5$).

Note that the production function presents constant returns to scale on effort and therefore if agent i doubles the amount of effort exerted, his output will also be doubled. The optimal level of effort exerted will be bounded by individual i's preferences on effort that will be analyzed in subsection 3.1.3

3.1.2 Profits of destruction

In this section I describe the benefits and cost of destructive behavior as if agent i was a profit maximizer of destructive behavior.

The cost of destruction

The cost of destructive action d_i against agent j is equal to the fraction of own output sacrificed to destroy j's output:

$$\gamma d_i Y_i$$

[7] As explained in section 2, a situation will be considered "fair" when endowment conditions are the same and the only difference in earnings is given by the amount of effort that is exerted by the agents.

where $\gamma d_i \in [0,1]$ (i.e., destructive behavior is always costly but cannot be greater than agent i"s output Y_i) and $\gamma > 0$ (i.e., the marginal cost of destructive action is constant and positive). The higher γ is, the more expensive is to destroy others and the smaller is the maximum level of destruction d_i that agent i can take. Conversely, the lower γ is, the more efficient is the destructive actions that agent i takes.

In order to illustrate this, imagine a dairy farmer (agent i) that wants to destroy another dairy farmer (agent j) by poisoning his cattle. Agent i can spend little time and money by poisoning the animal with a very powerful plant that he grows (i.e., very low γ) compared to a very expensive medicine that is hard to find (i.e., high γ).

Technology of destruction

Agent i's destructive action will affect negatively agent j's output by $(1 - p(d_i;\tau))Y_i$, similar to Gershman (2011), where $(1 - p(d_i;\tau))$ is the fraction of agent j's outcome destroyed by agent i, $p(d_i;\tau)$ is the fraction agent j is left with, and the technology of destruction is equal to:

$$p(d_i;\tau) = \frac{1}{1+\tau d_i}$$

where the function $p(d_i)$ is bounded, with $p(0) = 1$ and $p(1/\gamma) = \frac{\gamma}{\gamma+\tau}$, decreasing, and convex. Parameter $\tau \geq 0$ measures the effectiveness of the destructive action. In particular, destructive actions will be harmless if τ is low and increasingly harmful as τ increses [18] (Figure 4). In the example above, imagine agent j has insurance, then, the destruction action of agent i will not affect agent j's output as much (i.e., low τ) compared to a situation where agent j does not have any type of protection.

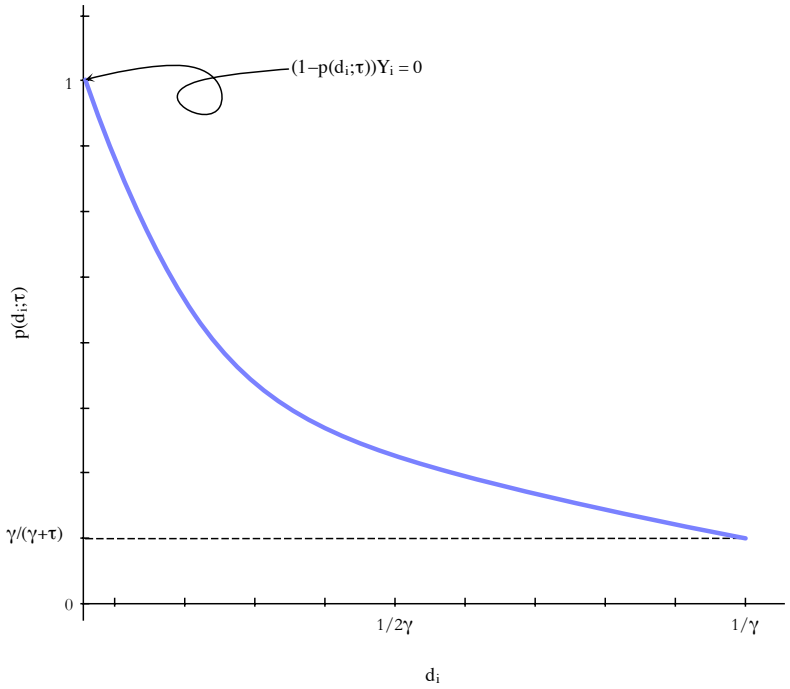


Figure 4: Function $p(d_i;\tau)$

The profit of destruction function

The profit function of destruction for agent i whose consumption level is lower than agent j's consumption level ($C_i < C_j$) is equal to:

$$D_i(d_i;\gamma,\tau,Y_i,Y_j) = \underbrace{\theta_i^a Y_j(1-p(d_i,\tau))}_{\text{Benefits}} - \underbrace{(1+\theta_i^a)Y_i\gamma d_i}_{\text{Costs}}$$

where θ_i^a is the price of destructive behavior (i.e., the value that agent i gives to the benefit of destroying agent j's output), and $(1+\theta_i^a)$ is the value of the cost of taking this action. The direct cost is valued at 1 (i.e., cost of each unit of forgone output due to destructive action) and the indirect cost valued at θ_i^a (i.e., cost of increasing the gap).

Profit maximization

Agent i maximizes his profit of destruction:

$$\frac{\partial D_i}{\partial d_i} = \underbrace{\frac{\theta_i^a Y_j \tau}{(1+\tau d_i)^2}}_{\text{Marginal benefits}} - \underbrace{(1+\theta_i^a)Y_i\gamma}_{\text{Marginal Costs}}$$

At an optimum, the marginal cost equals marginal benefits and the interior optimum is uniquely defined and equal to:

$$d_i^* = \left(\sqrt{\frac{\theta_i^a Y_j \tau}{(1+\theta_i^a)Y_i\gamma}} - 1\right)\frac{1}{\tau}$$

The optimal destruction intensity will be a function of the inequality (but not the scale) of outcomes, which captures the essence of destructive behavior[8]Marginal benefit will equal marginal cost when $\frac{Y_j}{Y_i} > \frac{(1+\theta_i^a)\gamma}{\theta_i^a\tau}$.

There are two extreme cases to consider that will lead to corner solutions (Figure 5):

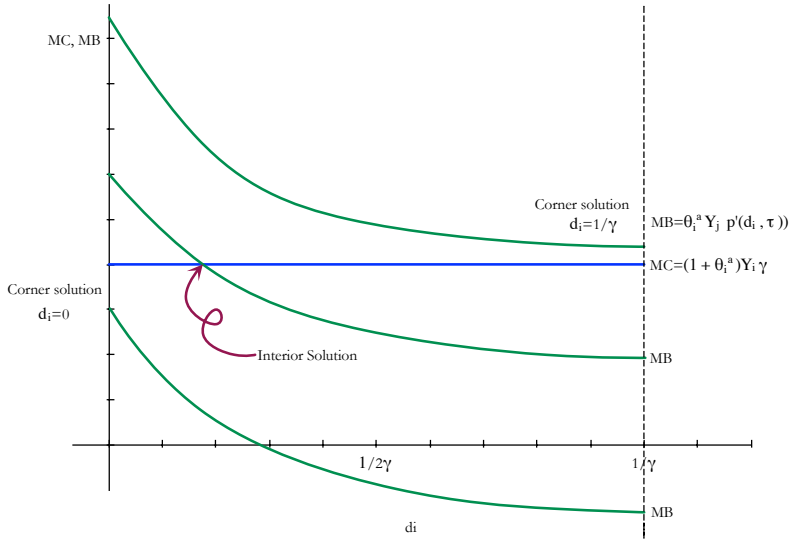


Figure 5: Marginal benefit vs. Marginal cost

Destructive behavior will be equal to zero when $\frac{Y_j}{Y_i} \leq \frac{(1+\theta_i^a)\gamma}{\theta_i^a\tau}$. Note that if $\theta_1^a = 0$ (i.e., no positional concerns), there is no destructive action. Finally, agent i will take the highest destructive action possible (i.e., $1/\gamma$) when $\frac{Y_j}{Y_i} \geq \frac{(1+\theta_i^a)(\gamma+\tau)^2}{\theta_i^a\tau\gamma}$.

[8]Since the benefit of destroying agent j's output is proportional to Y_j, if Y_j it is too big, the model predicts large destructive action (possible corner solution). This may not be realistic, however in the experimental settings, outcome differences are not large. Moreover, among homogenous groups, large outcome differences may not be that common

If $\theta_i^a > 0$, the decision about engaging in destructive behavior depends on relative earnings $\frac{Y_j}{Y_i}$. Then, if Y_i is high enough compared to Y_j, agent i finds it optimal to abstain from destruction, otherwise, it is optimal to engage in destruction. The intensity of destruction is increasing in output inequality, effectiveness of destructive technology τ, the strength of own positional concerns θ_i^a, but decreasing in cost of destruction γ, λ_i and $\frac{\beta_i}{\beta_j}$. Notice that if $e_i = e_j$ and $\lambda_i = \lambda_j$ (i.e., $K_i = K_j$), the only difference in outcomes is generated through the inequality in productive efficiency $\frac{\beta_i}{\beta_j}$.

Similarly agent j maximizes his profit of destruction. Agent j's consumption is higher than agent i's consumption ($C_i < C_j$) and the profits of destruction is valued at θ_j^b in this case as follows:

$$D_j(d_j; \gamma, \tau, Y_i, Y_j) = \underbrace{-\theta_j^b Y_i(1 - p(d_j, \tau))}_{\text{Benefits}} - \underbrace{(1 - \theta_j^b) Y_j \gamma d_j}_{\text{Costs}}$$

where θ_j^b is the price of destructive behavior and $(1 - \theta_j^b)$ is the value of the cost of taking this action. Note that if $0 < \theta_j^b < 1$ (i.e., the guilt case), the benefits of destruction are always negative and therefore will never take place. Destructive behavior will only happen when $-1 < \theta_j^b < 0$.

3.1.3 Utility maximizer

Finally, agents interact in the following two-stage game (Figure 6):

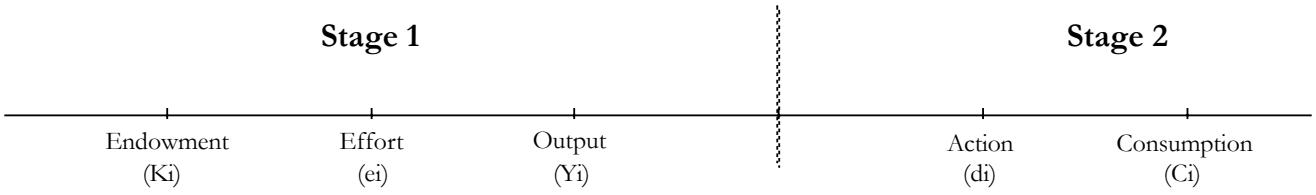


Figure 6: Timeline of events

In the first stage, agents maximize their level of effort to produce output Y_i as described in section 3.1.1. In the second stage, each agent decides whether to consume all his output, Y_i, or use part of his output to disrupt other agent's production output, where the optimal destruction intensity will be a function of the inequality of first-stage outcomes. In this stage, agents maximize their profit of destruction as described in section 3.1.2.

More formally, the consumption level of agent i is given by

$$C_i = Y_i - \gamma d_i Y_i - (1 - p(d_j))Y_i, \forall i \; i = 1, 2$$
$$C_i = Y_i(p(d_j; \tau) - \gamma d_i), \forall i \; i = 1, 2$$

and

$$\max_{d_i, e_i} U^i = \begin{cases} C_i - \theta_i^a(C_j - C_i) - e_i^\rho & \text{if } C_j > C_i \\ C_i - \theta_i^b(C_i - C_j) - e_j^\rho & \text{if } C_i > C_j \end{cases}$$

The model is solved backwards, starting at stage 2, when effort is sunk. Then, agent i choses the intensity of destruction d_i in order to maximize his utility:

$$\frac{\partial U^i}{\partial d_i}: \overbrace{\underbrace{\frac{\partial C_i}{\partial d_i}}_{<0}}^{\text{Marginal Cost}} - \theta_i^a \overbrace{\left(\underbrace{\frac{\partial \Delta_i}{\partial C_j}}_{>0} \underbrace{\frac{\partial C_j}{\partial p}}_{>0} \underbrace{\frac{\partial p}{\partial d_i}}_{<0} - \underbrace{\frac{\partial \Delta_i}{\partial C_i}}_{<0} \underbrace{\frac{\partial C_i}{\partial d_i}}_{<0} \right)}^{\text{Marginal Benefit}} = 0 \tag{2}$$

where Δ_i is the difference between C_j and C_i. As describe before, the direct cost of taking a destructive action is equal to the disutility generated from less consumption. The marginal benefit is equal to the utility generated from the reduction in the difference between agent j's and agent i's consumption levels. Marginal benefit is decreasing in d_i at a decreasing rate (i.e., the first unit of destruction bring more marginal utility than the second unit).

Since Agents are forward-looking, Agent i chooses his level of effort e_i according to the intensity of destruction d_i and d_j in the second stage in order to maximize his utility. In other words, they anticipate the optimal second-stage actions when making their first-stage decisions.

$$U^i = Y_i(\gamma d_i^*(e_i, e_j) - p(d_j^*(e_i, e_j))) - \theta_i^a (Y_j(\gamma d_j^*(e_i, e_j) - p(d_i^*(e_i, e_j))) - Y_i(\gamma d_i^*(e_i, e_j) - p(d_j^*(e_i, e_j)))) - e_1^\rho$$

$$\frac{\partial U^i}{\partial e_i}: \overbrace{\underbrace{\frac{\partial U^i}{\partial C_i}}_{>0} \underbrace{\frac{\partial C_i}{\partial e_i}}_{>0} - \theta_i^a \underbrace{\frac{\partial U^i}{\partial \Delta_i}}_{<0} \left(\underbrace{\frac{\partial \Delta_i}{\partial C_j}}_{>0} \underbrace{\frac{\partial C_j}{\partial e_i}}_{>0} - \underbrace{\frac{\partial \Delta_i}{\partial C_i}}_{<0} \underbrace{\frac{\partial C_i}{\partial e_i}}_{>0} \right)}^{\text{Marginal Benefit}} - \overbrace{\underbrace{\frac{\partial U^i}{\partial e_i}}_{<0}}^{\text{Marginal Cost}} = 0 \tag{3}$$

where the total benefit of exerting more effort, which comes from the benefit from more consumption and from reducing the difference, equals the total cost of effort.

4 Research Questions and Hypotheses

This section presents the main research questions and hypotheses with predictions from the theoretical model, that will be tested in section 6 with results from the behavioral experiment. First, I explore how, in the absence of destructive actions, positional concerns affect effort levels to test the "keep-up-with-the-Joneses effect". Then, in the presence of destructive behavior, I am interested in seeing what happens with effort levels and how destructive behavior is related to positional concerns. I want to identify who takes a "black" envy behavior and who takes a "white" envy behavior. Finally, I am interested in looking at the key mechanisms that may be driving destructive behavior.

4.1 Q1: Do positional concerns affect effort levels?

In order to test if positional concerns affect effort levels, I look at two hypotheses:

H1: In the absence of destructive behavior, individuals invest greater effort as a result of comparing themselves with others.

In the absence of destructive behavior, $U^i = C_i - \theta_i^a \max[C_j - C_i, 0] - \theta_i^b \max[C_i - C_j, 0] - e_i^\rho, \ \ \forall i \neq j$ where $C_i = Y_i = \beta_i K_i e_i$. Then, the optimum level of effort level is equal to:

$$e_i^* = \left(\frac{K_i \beta_i (1+\theta_i^a)}{\rho}\right)^{\frac{1}{\rho-1}}$$

When individual i is not concerned with his position relative to others, $\theta_i^a = \theta_i^b = 0$, and then $e_i^{**} = \left(\frac{K_i \beta_i}{\rho}\right)^{\frac{1}{\rho-1}}$ which is smaller than e_i^*. Then, individuals that earn relatively less than others will exert more effort to "catch up" with others.

H2: Individuals concerned more with their relative position exert more effort than others less concerned.

The higher θ_i^a is, the more effort e_i^* is exerted at a constant rate:

$$\frac{\partial e_i^*}{\partial \theta_i^a} = \frac{1}{\rho-1}\left(\frac{K_i \beta_i}{\rho}\right)^{\frac{2-\rho}{\rho-1}} > 0$$

Note that individuals that earn relatively more than others will also exert more effort if $-1 < \theta_i^b < 0$ (i.e., individual i enjoys being ahead of others); and will exert less effort if $0 < \theta_i^b < 1$ (i.e., individual i gets disutility from being ahead of others due to guilt).

4.2 Q2: Does destructive behavior reduce welfare?

In order to test if destructive behavior leads to lower welfare, I look at the direct and indirect effect of destructive actions on welfare. On one hand, destructive behavior can reduce welfare directly by destroying someones output, and indirectly if the treat of destructive actions induces ex-ante behavioral responses in the form of lowers level of effort. Specifically, I look at two hypotheses:

H3: When destructive actions are allowed, individuals with lower output take a destructive action against the most advanced ones by taking away some of their output.

When destructive behavior is allowed, $U^i = C_i - \theta_i^a \max[C_j - C_i, 0] - \theta_i^b \max[C_i - C_j, 0] - e_i^\rho, \ \ \forall i \neq j$ where $C_i = Y_i((1 - p(d_j)) - \gamma d_i)$. Then, the optimum level of destructive behavior for people below others (i.e., when $C_i < C_j$) is equal to:

$$d_i(e_i, e_j)^* = \frac{1}{\tau}\left(\sqrt{\frac{\theta_i^a \tau Y_j}{(1+\theta_i^a)\gamma Y_i}} - 1\right)$$

Marginal benefit will equal marginal cost when $\frac{Y_j}{Y_i} > \frac{(1+\theta_i^a)\gamma}{\theta_i^a \tau}$ and therefore agent i will take a destructive action against agent j that has a higher output. Note that if $Y_j = Y_i$ (i.e., "fair scenario" with equal levels of effort), destructive behavior can still happen if $\frac{(1+\theta_i^a)\gamma}{\theta_i^a \tau} < 1$ and this will depend directly on how costly destructive behavior is to agent i measured by γ and how effective it is measured by τ.

H4: Highly ranked individuals reduce their effort out of fear of retaliation from the more disadvantaged ones.

If individual i is highly ranked (i.e., $C_i > C_j$) and destructive behavior is allowed, agent j's possible destructive action affects agent i's effort allocation decision:

$$U^i = Y_i(\gamma d_i^*(e_i, e_j) - p(d_j^*(e_i, e_j))) - \theta_i^b(Y_i(\gamma d_i^*(e_i, e_j) - p(d_j^*(e_i, e_j))) - Y_j(\gamma d_j^*(e_i, e_j) - p(d_i^*(e_i, e_j)))) - e_1^\rho$$

where

$$e_i^*|_{d_j^*=0} > e_i^*|_{d_j^*>0}$$

4.3 Q3: Do individuals who place greater weight on their position relative to others take more destructive actions?

H5: When individuals place greater weight on their position relative to others, destructive action increases.

The theoretical model predicts that the more positional concern is individual i the higher the destructive behavior he will take.

$$\frac{\partial d_i(e_i, e_j)^*}{\partial \theta_i^a} = \frac{1}{2\tau} d_i(e_i, e_j)^* \frac{1}{\theta_i^a(1+\theta_i^a)} > 0$$

I also want to test if there are some specific socio-economic characteristics that may explain the likelihood of taking a destructive action.

The next set of questions and hypotheses investigate the motives behind destructive behavior. I investigate whether individuals "pull down" anyone in their group who earns more money or whether this action is continent upon the way in which income is earned. In particular, I answer the following questions:

4.4 Q4: Is destructive behavior more likely to occur if individuals are averse to inequity?

H6: An individual takes more destructive actions when there are endowment inequalities.

When endowment inequalities are introduced (i.e., $\lambda_i \neq 0.5$) the model predicts that:

$$\frac{\partial d_i(e_i,e_j)^*}{\partial \lambda_j} = \frac{1}{2\tau} d_i(e_i,e_j)^* \frac{1}{\lambda_j * (1-\lambda_j)} > 0$$

Then, if individual j receives a higher endowment than individual i, the destructive actions that agent i takes will be larger.

H7: An individual takes destructive actions even under complete equality.

If $Y_j = Y_i$, the theoretical model predicts that destructive behavior can still happen if $\frac{(1+\theta_i^a)\gamma}{\theta_i^a \tau} < 1$ and this will depend directly on how costly destructive behavior is to agent i measured by γ and how effective it is, measured by τ.

4.5 Q5: Is destructive behavior more likely to occur if individuals are averse to inequality?

There are four ways in which results from the experiment will be used to test if destructive behavior is more likely to occur if individuals are averse to inequality:

H8: When destructive behavior takes the form of a progressive taxation and further equal redistribution, individuals take more destructive actions.

H9: Individual reduces the outcome of the "richest" individual more than the second richest and so on (i.e., rank egalitarian).

H10: Individuals take more destructive behavior as the absolute difference between agent i's earnings and agent j's earnings increases (a la Fehr and Schmidt (1999)).

H11: Individuals take more destructive behavior as the relative position of the agent i compared to the mean payoff of the other agents increases (a la Bolton and Ockenfels (2000)).

5 Behavioral Experiment

The experimental game was designed to mimic the theoretical model as close as possible in order to compare the predictions of the model with results from the field. The experimental design also allows to tease out the motivations behind destructive behavior, specifically, how aversion to inequity and inequality affect destructive behavior in the game.

The experimental design builds on the two-stage "money burning" game of Zizzo and Oswald (2001) [53] which has two stages: a betting stage and a burning stage. The "betting" stage introduces random variation in participants' earnings, while the "burning" stage allows participants to alter this distribution by engaging in "money burning" whereby subjects can pay to reduce others' earnings. I modify this design in two ways. First, I replace the random generation of participants' earnings with a simple effort task in the first stage; specifically, earnings depend on the number of beans individuals separate from a container full of beans and rice. Second, I ask subjects to participate in separate activities that present alternative scenarios that vary the incentives to burn money in the second stage.

5.1 Experimental Design

Overview

Each experimental session consisted in 10 activities and a questionnaire[9], lasted approximately 3.5 hours, and 10 or 15 individuals participated in each session. The questionnaire was composed of socio-economic questions, questions about the participants in their session, and questions that focused on players' experience within the game.

Activities were organized in a particular order to answer the different hypotheses and to control for order effects when needed. Activities 1, 2 and 3 were always in the same order, Activities 4, 5 and 6 were randomized by session, Activity 7 served as control for Activity 3, and Activity 8, 9 and 10 were always at the end and in that order.

Groups of 5 were formed randomly and individuals did not know the identity of the members of their groups at any time (i.e., even though the participants in a session can see each other, their group composition was kept unknown at all times). The group composition was fixed in Activities 1 to 7 to increase the number of independent observations to improve statistical power. Groups were changed for Activities 8 and 9, and Activity 10 was played individually.

In the first 7 Activities individuals played the effort task: each individual received a bucket with 2 cups of rice and 1 cup of beans (i.e., equal endowments). Each individual had to collect as many beans as possible in one minute and received Bs. 50cts (about US$ 7.2 cts) per gram of beans collected. In Activities 3 to 9 individuals played the burning stage; after all individuals are informed of the earnings of others and their ranking in the group, each individual had to choose whether they wanted to pay to reduce others' earnings (i.e., this decision was made for each of the other 4 members of the group indicating zero or any amount above zero). It was highlighted in the game that they could not burn their own money. The cost of burning money was one tenth of the amount to burn.[10].

While everyone made money-burning choices, only those of two of them, individual i and another individual j ($i \neq j$) determined randomly, got implemented and determined final winnings for individual i. Hence, even though the amounts of all the players of each group that want to burn are recorded, only the choices of individual i and a random dictator j are used to determine the actual money to be burnt. This modified design enabled subjects to determine how much money they want to burn as

[9]The experimental script and questionnaire are in the Appendix.

[10]Zizzo 2003 found that money burning was mostly inelastic when $p = 0.02$ to $p = 0.25$ [51]. For sake of comparison I chose $p = 0.1$ similar to the cost of burning money in Kebede and Zizzo 2015 [28]

an individual choice task while allowing for expectations about the burning by only one individual to mimic the theoretical model presented in Section 3. It also prevented below-zero outcomes [51].

Finally, in order to ensure independence across activities, final payments to participants were equal to the final earnings of only one activity that was randomly chosen by drawing a chip from a bag. The number on the chip that each participant drown from the bag represented the outcome of the activity that he received as final payment. Individuals only saw their final outcome of the activity that was randomly selected (i.e., they only knew if somebody decided to "burn money" at the end of all the activities, and the name of the randomly chosen "dictator" was kept anonymous). This was done in order to ensure anonymity and avoid possible retaliation within the game and outside the game.

5.1.1 Description of Activities

Activity 1. Effort: At the beginning of the activity, individuals were randomly assigned in a group of 5. In this activity they just played the effort task. Each individual received a bucket with 2 cups of rice and 1 cup of beans. Individuals had to collect as many beans as possible in 1 minute. For every gram of beans that an individual collected, he received 50 cents. They repeated the effort task 3 times and the final outcome of this activity was equal to the average of their earning in each round.

Activity 2. Positional Concerns and Effort Levels: At the beginning of the activity, individuals were presented with the average earnings of Activity 1 of others in their group from high to low with a number that represented their ranking in their group (1 being the person that earned the most in the group, and 5 the person that earned the least). The names of others in their group were kept anonymous. After seeing the output of others and their ranking in the group, individuals were asked to play the effort task again.

Activity 3. Destructive Behavior Allowed: In this activity, individuals played a two stage game:

Stage 1: Effort task

Stage 2: After individuals were informed of the earnings of others and their ranking in the group, all 5 members of the group were asked to decide whether they wanted to pay money to "burn" (take away) part of others' earnings. For each boliviano that they decided to take away from another individual, the "dictator" had to pay 10 cents from his own earnings.

Activity 4. Destructive Behavior Allowed with Redistribution: This activity is similar to Activity 3, except that all participants were informed at the beginning of the activity that the money "burned" from others will be evenly redistributed among every member of their group.

Activity 5. Destructive Behavior Allowed with Endowment Inequality: This activity is similar to Activity 3, however, in this activity one member of each group received more beans that the rest (2 cups), making it easier to collect more beans.

Activity 6. Destructive Behavior Allowed with Equal Earnings: Similar to Activity 3, except that in this activity the earning of each individual are generated as a group and are equal for everybody. Individuals received 50 cents for every gram of beans that the group collected in average (i.e., $Earnings_i = 0.5\left(\frac{\sum_i^5 beans_i}{5}\right)$).

Activity 7. Destructive Behavior Allowed: This is exactly as Activity 3 and serves as control.

Activity 8. Destructive Behavior Allowed with Equal Probability of Earnings: Each individual received a bag with 10 chips (5 green chips and 5 red chips).

Stage 1: Individuals had to randomly choose one chip. If an individual got a green chip, he received 50 bolivianos, if he got a red chip, he received 20 bolivianos.

Stage 2: Burning stage

Activity 9. Destructive Behavior Allowed with unequal probability of earnings: Similar to Activity 8, except that in this activity, some individuals in each group received a bag with 8 green chips and 2 red chips, therefore the probability of getting a green chip was higher and therefore it was more likely to get the higher outcome.

Activity 10: Positional Concerns This activity aims to parametrize θ_i. I used a survey instrument constructed by Pingle and Mitchell (2002) where subjects were asked a series of hypothetical labor market situations and then classify individuals according to their answers in one of the following categories: 1) no positional concern, 2) global follower, 3) follow up, 4) follow down, 5) global deviant, 6) deviant up, 7) deviant down, 8) follow up, deviant down, and 9) follow down, deviant up. In order to do so, a series of three rounds were played: 1) a labor leisure choice problem, 2) a positional concerns table where the wages of others were held fixed but the work hours of others varied, and 2) a positional concerns table where the work hours of others were held fixed but the wages of others varied.

In each round, participants had to chose their preferred work-income combination under different hypothetical situations where the reference preferred work-income combination changes. The experimental script, which is in the appendix, describes this activity in detail.

5.1.2 The questionnaire

The questionnaire was divided in 4 sections:

- **Socio Demographic Information:** 28 questions that covered: gender, civil status, education, main occupation, individual income, family size, etc. There is a strong emphasis on education, income expectations, and milk production.
- **Group Information:** 4 social-capital related questions.
- **Experimental Reaction:** 7 questions designed to capture their perceptions and reactions of the experimental session.
- **Hypothetical Questions:** 4 questions meant to capture another proxy of how concerned they are relative to others.

5.2 Experimental Site

The game sessions were carried out with members of dairy cooperatives in the Altiplano of Bolivia. I choose Bolivia as the site for this experiment for two methodological reasons. First, carrying out this experiment among dairy cooperative members can give us a deeper understanding of the causes of and the efficiency and productivity implications of destructive behavior in populations where these concerns are highly relevant. Moreover, given that the new Bolivian constitution stresses the importance of values of unity, equality, inclusion, reciprocity, equal opportunities, responsibility, distribution and redistribution of social good as foundations to "live well", studying how aversion to inequality, unfairness, and envy affects individual decision-making makes it highly relevant to the current policy debate in Bolivia.

Second, given the nature of the experiment, it is important that decisions are made based on earnings that are relevant to the participants. Average payments to participants were around US$10 that is about a day's and a half wage in the Bolivian context.

Figure 7: Site. Experimental sessions were carried out in four communities in the Bolivian Altiplano located near the Lake Titicaca.

The experiments were carried out in four communities in the Altiplano of Bolivia that supply milk to *Delizia*. *Delizia* has 53% of the ice-cream market in Bolivia, 30% of the yogurt market, and 10% of the dairy market. *Delizia* collects 45,000 to 55,000 liters of milk per day from about 2,700 dairy farmers. Each dairy farmer that supplies milk to *Delizia* has in average 5 cows with a maximum of 10 cows.

These communities are located in the altiplano close the the Lake Titicaca (Figure 7). People in this region are in general Aymaras. Aymara people are an indigenous nation located in the Andes and Altiplano of Bolivia, Peru, and Chile. Aymaras' ancestors lived in this region for many centuries before the Incas, and evidence shows that Aymaras have occupied the Andes for at least 800 years. Most of Aymaras speak spanish as a second language (specially younger generations). Aymara people use the "AYNI" as their socioeconomic system that is based on two key concepts: reciprocity and complementarity that will be important to take into consideration in the discussion.

In general, communities in the altiplano sell their milk to *Delizia* or Pil[11]. However, dairy farmers are only part of one of them. The four communities are:

- **Avichaca:** a fairly large town next to Achacachi where most of the people are dedicated to agriculture or dairy. *Delizia* has 199 dairy farmers there. Avichaca is about 90Km from La Paz.

[11]Pil is the biggest dairy factory in Bolivia.

- **Cucuta:** located near El Alto, about 22Km from the center La Paz. *Delizia* only works with female producers in this town and has 54 in 3 three different groups.
- **Viacha:** one of the biggest towns in the altiplano that is about 26Km from La Paz. The dairy farmers are located about 2 Km from the center of Viacha. *Delizia* works with 131 dairy farmers there in 4 different groups.
- **Patamanta:** a small town located 35Km from the center of La Paz, *Delizia* works with about 69 dairy farmers.

5.3 Descriptive Statistics

The participants

Who are they?

Table 1 presents summary statistics of the main socio-economic characteristics of the participants. Of all the participants, 60.7% are female, they are 40 years old in average, three-fourths are married and Aymara indigenous. In average, they have 8.3 years of education, 91.2% of them know how to read and write and the last time they were in school was 20 years ago when they were 17 years old, in average. People consider themselves somewhat competitive, giving themselves a score of 7 out of 10 where 10 is extremely competitive.

About two-thirds of the participants report being the head of the household (48% are female). Most of the participants own a house (95%) and in average 4.6 people live in the house (2.8 are kids). A little less than half of the household members contribute to the household income. The house has in average 4 rooms, and half of these are used to sleep resulting in a people-per-room ratio of 2.48 (Table 1).

What do they do?

The majority of dairy farmers in the Bolivian altiplano are small scale producers with 10 cows at most. Of all the participants in the experiment, 84% are dairy farmers and 81% of them supply milk to *Delizia*. In average, they have 7 cows and about half were actively producing milk at the time of the interview. Their self-reported daily production of milk, in average, is 10.66 liters per cow (Table 2).

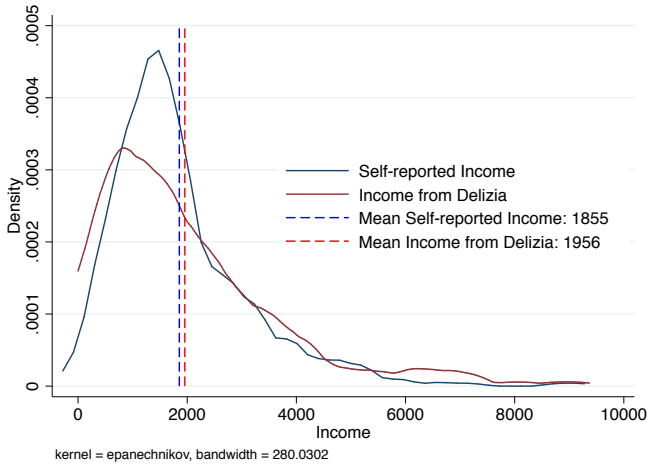


Figure 8: Distribution of self reported earnings and average income over the last 12 months reported by *Delizia*.

Figure 8 shows the distribution of self reported earnings and payments reported by *Delizia*. Their average self-reported monthly earnings is about 269USD, which is slightly lower than their average

monthly payments over the past 12 months reported by *Delizia*, which is about 283.5USD.

Expectations

In average, participants believe that they have 68% chance that their cows will produce more milk, 57% chance that they become the biggest producer in the community, 47% that they earn half of what they earn now, and 54% chance that they earn double of what they earn now (Table 3). Their self-reported earnings are about 269USD slightly skewed to the left, and in average they don't think they will earn less than 168USD and no more than 385USD (Figure 9).

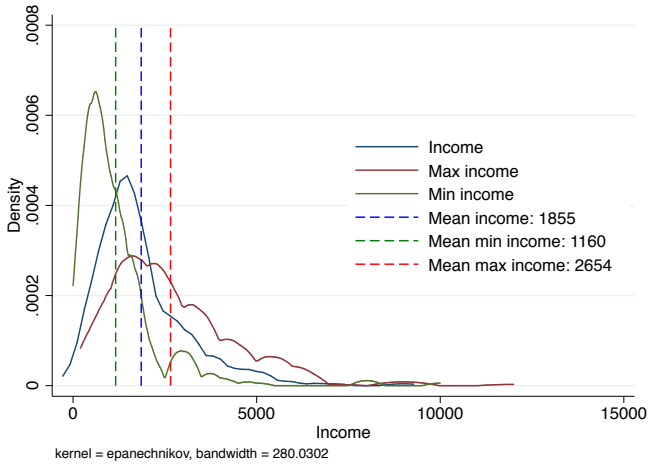


Figure 9: Self reported earnings and maximum and minimum expected earnings in the next 12 months.

The experiment

Composition of each session

Each session had in average 14 participants (58% of the sessions had 15 participants). In average, participants knew 82% of the names of the people in their session, 8.3% of their mobile numbers, they would invite 62.5% of them to their house for a special location, and would help only 30% of the people in the session (Table 4). I use a factor analysis to construct a social capital index using these variables to control for social tightness in the group.

Experience in the game

Of all the participants, 11.2% felt envious when somebody were above them and 25% feared the envy of others when they had more money.

Fairness considerations

Of all the participants, 91.5% believe that it is fair to earn more when you work more, 87.8% believe that it is fair to earn more when you work better, 46.3% believe that everybody should earn the same regardless of their effort, and only 37% believe that it is fair to receive preferences that will make you earn more than the rest (Table 4).

6 Results

The hypotheses stated in section 4 will be tested using a variation of the following empirical estimation:

$$Y_{it} = \beta_0 + \beta_1 \underline{X_i} + \beta_2 \underline{Z_i} + \beta_3 EXP + \epsilon_i \quad (4)$$

where Y_{it} will be equal to the effort exerted by agent i in round/activity t or a measurement of destructive behavior that agent i takes against agent j in activity t. It will be a function of: i) a set of explanatory variables $\underline{X_i}$ that will vary for each hypothesis ii) a set of individual characteristics $\underline{Z_i}$, iii) session fixed effects and order fixed effects (when needed), and iv) clustered errors at the session level.

Table 5 summarizes how the different activities from the experimental game are used to answer each of the hypotheses.

6.1 Q1: Do positional concerns affect effort levels?

In order to test if positional concerns affect effort levels, I look at two hypotheses:

H1: In the absence of destructive behavior, individuals invest greater effort as a result of comparing themselves with others.

To test this hypothesis, I use the first two activities of the experimental game. Recall that in activity 1 individuals play the effort task 3 times. After they were presented with their earnings in each round and the average or their earnings in the three rounds, activity 2 started by showing them how much others in their group earned (in order from high to low) and their ranking.

This hypothesis is tested with the following empirical estimation:

$$e_{it} = \beta_0 + \beta_1 T + \beta_2 \underline{Z_i} + \beta_3 EXP + \epsilon_{it}$$

where e_{it} is the effort level agent i exerts in each round t (i.e., activity 2 is considered round 4). It is a function of: i) T which is a dummy equal to 1 for activity 2 and zero otherwise, ii) a set of individual characteristics $\underline{Z_i}$, and iii) some dummies to control for experimental session. If β_1 is positive and significant, agent i exerts more effort after knowing his relative position and ranking in his group.

Table 6 presents the results of the estimation. Specifications (1) and (2) compare the mean of earnings in activity 1 vs. activity 2. The difference in the mean of earnings in activity 1 and activity 2 is statistically different from zero and equal to 5.29 bolivianos which represents an increase of about 18% even when controlling for socio-economic characteristics and session fixed effects. However, this result may be biased upwards since we need to control for possible learning effects in the effort task. I control for this using a regression discontinuity design in two different ways: first, I compare round 3 of activity 1 and activity 2 (presented in specifications (3) and (4)) and find that T is significant and positive; and second, I impose a functional form to control for learning effects which is increasing in repetition at a decreasing rate (I use a log function). When I use this method, I find that there is no effect on effort when individuals know their relative position and ranking in their group[12]. From the set of individual characteristics that are used as controls, I find that females get higher experimental earnings by about 5 bolivianos extra in most of the specifications. I also find that married people and head of the households also get higher experimental earnings, all significant at 1% level.

When I analyze the same set of regressions for people above and below the within-group mean I find that people above the mean exert less effort and people below the mean exert more effort when they are presented with their ranking (Table 7, specifications (5) and (6)). According to this, the motivation

[12]Results are robust when clustering at the individual level, and using individual fixed effects

driving these results among people above the mean may be due to guilt (i.e., it seems that $0 < \theta_i^b < 1$); people below the mean seem to be motivated by "white envy". Figure 10 shows the distribution of earnings in each round and the fitted values of the model described in specification (5). Note that the fitted values in each round is simple the mean of earnings of that round and the difference between the fitted value of the model and mean in the last round is equal to the treatment effect.

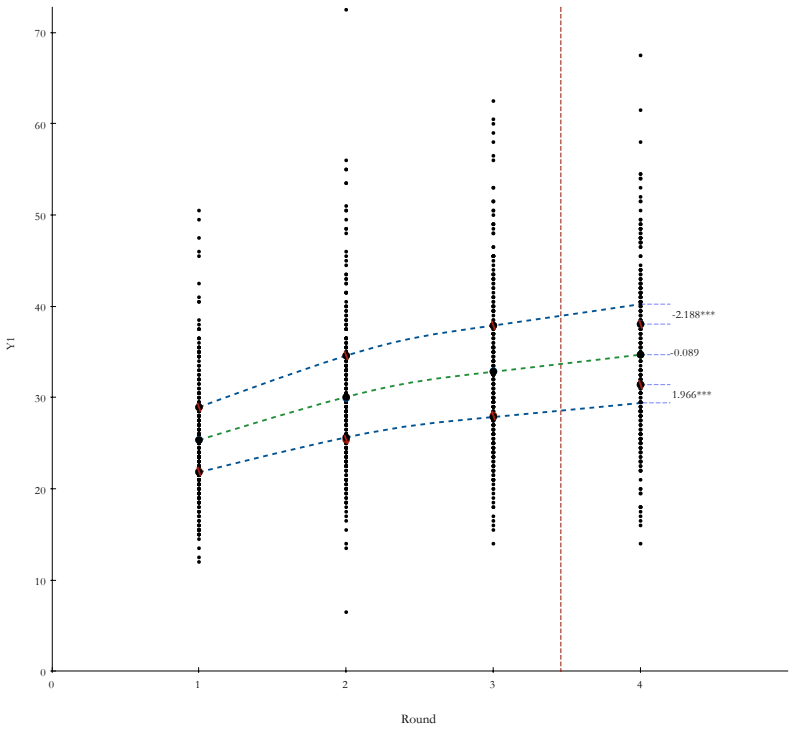


Figure 10: Effort and Positional Concerns. The black dots represent the distribution of earnings in each round. The green line connects the average earnings in each round and projected earnings in Activity 2 (round 4). The average earning of the people above/below the within-group mean in each round and projected earnings in round 4 is represented by the top/bottom blue line. Treatment happens between round 3 and 4 represented by the red line.

H2: Individuals concerned more with their relative position exert more effort than others less concerned.

In order to measure how concerned are individuals with respect to others in their group I use the survey instrument developed by Pingle and Mitchell (2002) described in section 5. Recall that participants have to choose their preferred work-income combination under different scenarios that vary in the preferred combination of others around them. I will focus on the first and second part of the survey instrument. Individuals were asked to complete Table 8 which contains 5 hypothetical economies. In each column there are 11 pairs of hour-wage decisions that they can pick from. Column C is the base line that is identical to the first part of the survey instrument. In this hypothetical economy, individuals are told that everybody around them work 40 hours and earn 2500 bolivianos and they are asked to choose whether they want to work the same and earn the same, less and earn less, or more and earn more. After they made their decision in Part 1, which is identical to column 2C, they are asked to choose their preferred work-income combination for economies 2D and 2E in Part 2 of the survey instrument. Note that there is no change in the budget constraint facing the participants, so if

individual i is no positional concerned, he will not change his preferred choice. However, if he sacrifices leisure for additional income, he will be a "Follower"; and he will be a "deviant" if he increases his leisure time and sacrifices income. Finally, they choose their preferred work-income combination for economies 2A and 2B where other individuals value more their leisure time and therefore work less.

A participant who has no positional concerns would not change his labor choice as move is made from one hypothetical economy to another. Figure 11 show that the average participant exhibits a positional concern very similar to the results found by Pingle and Mitchell (2002). The average participant exhibited significant "follower" behavior which is significantly different than the base economy in all the scenarios (i.e., the follower decided to work less in case A and B, and more in D and E), the average hours chosen in the base economy was 44.5. Moreover, participants chose to work more than the reference point in economy A, B, and C and less in economy E. There is no statistically difference in economy D from the reference point.

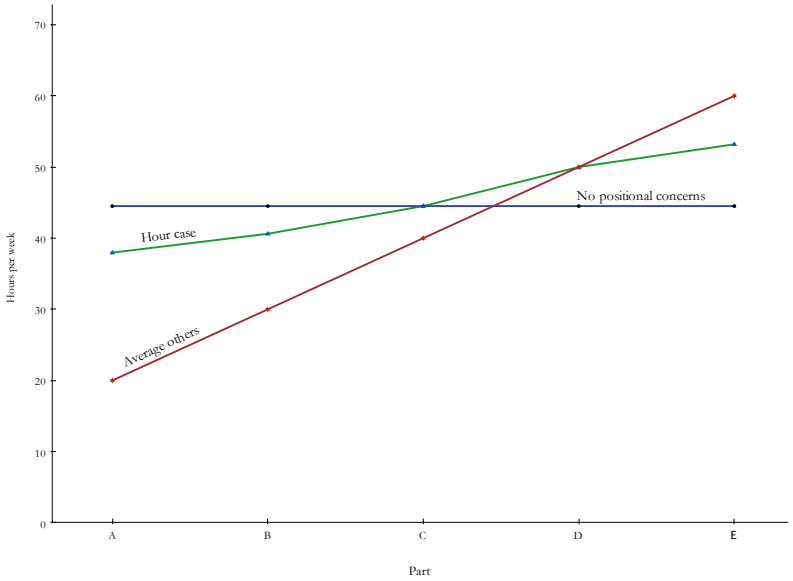


Figure 11: Positional Concerns. The average participant exhibited significant "follower" behavior (green line) which is significantly different than the base economy (blue line) in all the scenarios, the average hours chosen in the base economy was 44.5. Participants chose to work more than the reference point (red line) in economy A, B, and C and less in economy E.

However, while the average participant was a follower, there is heterogeneity in their behavior and I replicate the classification that Pingle and Mitchell (2002) do. Table 9 indicates the behavioral categories that are defined based upon the work-hour choices in column A and E relative to C. If $2A = 2C = 2E$, the participant is not positional concern (17.5%), and if $2A < 2C < 2E$ the participant is a global follower (37.9%). The other 7 classifications and their definition are detailed in Table 9.

In order to control for positional concerns, I only use the following categories: Follower if individual choses to work 40 hours in economy 2C (30.5%); "below" if in column 2C the participant choses to work less than 40 hours (8.4%); "above" if in column 2C he choses to work more than 40 hours (43.5%); and no positional concern if $2A = 2C = 2E$ (17.5%).

Table 10 shows the heterogenous treatment effect in each of the 4 categories for people above and below the within-group mean using specification (5) in Table 7[13]. Followers are trying to converge (i.e., followers above the mean exert less effort, and followers below the mean exert more effort).

[13]Results are robust when controlling for socio-economic characteristics and session fixed effects.

The treatment effect is not significant among participants without positional concerns. Interestingly, participants above the mean that like to be "below" others, are the ones with the highest decrease in effort after they know their ranking.

6.2 Q2: Does destructive behavior reduce welfare?

In order to test if destructive behavior leads to lower welfare, I look at the direct and indirect effect of destructive actions on welfare. On one hand, destructive behavior can reduce welfare directly by destroying someones output, and indirectly if the threat of destructive actions induces ex-ante behavioral responses in the form of lowers level of effort. Specifically:

H3: When destructive actions are allowed, individuals with lower output take a destructive action against the most advanced ones by taking away some of their output.

Participants took four burning decisions in activity 3 (one for each member of their group), so there are 1,140 observations in this activity. Out of 1,140 decisions taken, 302 or 26.5% were burning decisions, 55% of people took at least one destructive action against somebody in their group. People that were affected by the destructive behavior of others, lost in total 34.2% of their earnings, in average. The overall burning rate, which is defined as the percentage of money an individual burns, is equal to 5.14%.

Table 11 presents the burning behavior by ranking, above/below the mean and total. More people below the mean took at least one burning decision than people above the mean (statistically different from zero, $p<0.05$) where people ranked 4th are the ones that took the most burning actions spending about 6% of their earnings. Most of the burning decisions are against somebody above, however, there is a considerable amount of people that took a destructive action against somebody below, in particular people who were ranked first and second. Interestingly, people who were in the second place took money away from people above them (i.e., the first ones) but also from people below. Actually, 22.2% of people in this bin took money away from both.

H4: Highly ranked individuals reduce their effort out of fear of retaliation from the more disadvantaged ones.

Individuals that said that they fear the envy of others exerted, in average, a little less effort than individuals who don't. This is highly significant and relevant among individuals that were ranked first in their group (i.e., people that had the highest earnings). Individuals in this rank who fear the envy of others earned, in average, 5.3 bolivianos less than individuals who said that they don't fear the envy of others (36.8 compared to 42.1). In other words, people who fear the envy of others earned 12.6% less (i.e., they put less effort).

Moreover, to test if individuals reduced their effort levels when destructive behavior was introduced, I use the first three activities of the experimental game. Recall that in activity 3 individuals play the effort task in the first stage, and in the second stage, after they are presented with the earnings of others in their group and their ranking, they are giving the opportunity to pay to reduce the earnings of others.

This hypothesis is tested with the following empirical estimation:

$$e_{it} = \beta_0 + \beta_1 T_2 + \beta_2 T_3 + \beta_3 \underline{Z_i} + \beta_4 EXP + \epsilon_{it}$$

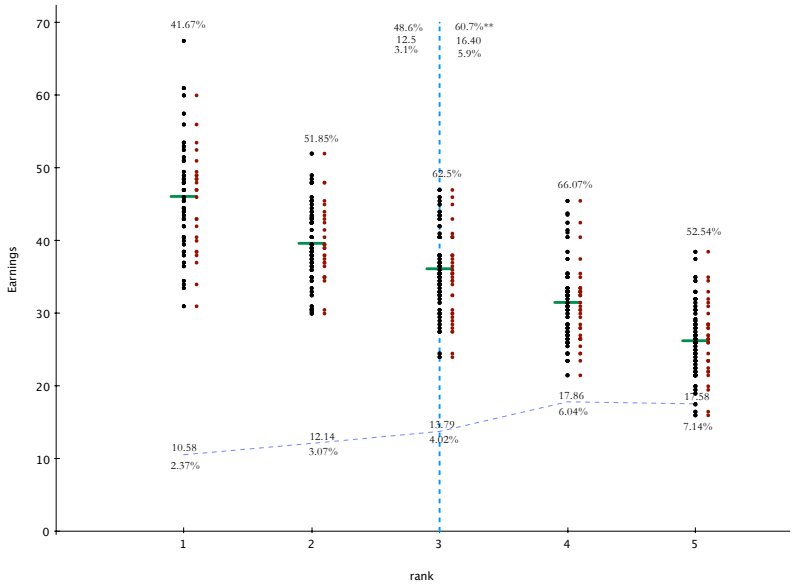


Figure 12: Who burns?. The distribution of earnings is presented by rank, the top number represents the percentage of people in that rank that took a burning decision against somebody in their group (represented by the red dots), the second number is the total amount of money they took from others in average, and the third number is the percentage of their earnings spent in burning behavior.

where e_{it} is the effort level agent i exerts in each round t in order to have outcome Y_{it} (i.e., activity 2 is considered round 4, and activity 3 is considered round 5). It is a function of: i) T_2 which is a dummy equal to 1 for activity 2 and zero otherwise, ii) T_3 which is also a dummy equal to 1 for activity 3 and zero otherwise, iii) a set of individual characteristics $\underline{Z_i}$, and iv) some dummies to control for experimental session. In this estimation, β_1 is capturing the effect on agent i's effort of knowing his relative position and ranking in his group. β_2 is capturing the effect on agent i's effort of knowing his relative position and ranking in his group plus the effect of knowing that destructive behavior is possible. Then, the net effect of the possibility of destructive behavior on effort levels will be equal to $\beta_2 - \beta_1$.

Similar to the estimation strategy used in Question 1, I control for possible learning effects of the effort task using the two methods described before. When I compare activity 2 (round 4) vs. activity 3 (round 5), that is presented in specifications (1) and (2) in Table 12, I find that $T3$ is significant and positive and equal to 1.1 bolivianos even when I control for socio-economic characteristics and session fixed effects. However, as explained before, in order to tease out the pure effect of the possibility of destructive behavior on effort levels, I use activity 1, 2 and 3. Specifications (3) and (4) test round 3 of activity 1, activity 2, and activity 3 and find that that the difference between $T3$ and $T2$ (i.e., $\beta_2 - \beta_1$) is positive and significantly different from zero and equal to 1.11 (same result found in specification (1)). However, when I impose the functional form to control for learning effects using all the rounds of activity 1, I find that there is no effect on effort when individuals know that others around can burn part of their earnings after they are presented with their relative positions (specifications (5) and (6)).

When I analyze the same set of regressions for people above and below the within-group mean I find that people below the mean exert more effort under the presence of possible destructive behavior (i.e., $T3$ is positive and significantly different from zero) however, this seems to be explained mostly by the positional concern effect (i.e., $\beta_2 - \beta_1$ is not statistically different from zero). Similarly, people that are above the within-group mean exert less effort under the presence of possible destructive actions, but it also seems to be explained mostly by a positional concern effect (Table 13, specifications (5) and

(6)). Figure 13 shows the distribution of earnings in each round and the fitted values of the model described in specification (5).

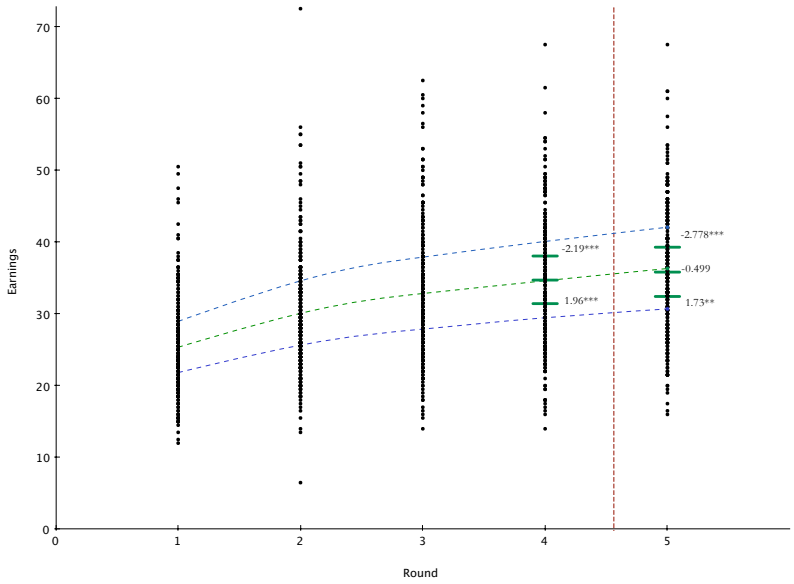


Figure 13: Effort and Destructive Behavior. The black dots represent the distribution of earnings in each round. The green line connects the average earnings in each round and projected earnings in Activity 2 (round 4) and in Activity 3 (round 5). The average earning of the people above/below the within-group mean in each round and projected earnings in round 4 and 5 is represented by the top/bottom blue line. Treatment happens between round 4 and 5 represented by the red line.

Table 14 shows the heterogenous treatment effect in each of the 4 behavioral types described before for people above and below the within-group mean. As we saw before, followers are trying to converge when they are presented with their ranking (i.e., followers above the mean exert less effort, and followers below the mean exert more effort) and this pattern continues when the possibility of destructive behavior is introduced. However, the net treatment effect of knowing that destructive behavior is possible among followers below the mean is insignificantly different from zero. This is also true for most of the behavioral types except in the case of followers above the mean. The net treatment effect of knowing that destructive behavior is possible on effort is negative and significant (i.e., the threat of destructive behavior reduces effort among successful "followers").

6.3 Q3: Do individuals who place greater weight on their position relative to others take more destructive behavior?

In order to test if individuals, who place greater weight on their position relative to others, take more destructive actions, I look at the following hypothesis:

H5: When individuals place greater weight on their position relative to others, destructive action increases.

Table 15 presents the destructive behavior by their behavioral type when they are above and below the within-group mean. As we showed before, more people take destructive actions against somebody in their group when they are below the mean (60.7% compared to 48.6%). Among the individuals that were below the within-group mean, people with positional concerns took a little more destructive behavior

than people that were not positional concerned but this difference is not significantly different from zero. On the other hand, people that were above the within-group mean that are positional concerned took more destructive behavior than people that are not positional concerned (53.1% compared to 29.6%). Interestingly, people that stated that like to be below others, took the most amount of destructive behavior overall (column (1)). Column (2) shows the burning rate by behavioral type. The burning rate among people below the mean is higher than people above the mean, and it is also higher among people that stated that like to be below others.

Moreover, I test a series of socio-economic characteristics on the likelihood of burning decisions using a Logit MLE on activity 3 with two different specifications. I first test the likelihood that individual i takes a destructive action against agent j when agent i is below agent j and then when agent i is above agent j (Table 16, specifications (1) and (2) respectively). I then test the likelihood that individual i takes a destructive action against somebody in his group when agent i is below the within-group mean and when agent i is above the within-group mean (specifications (3) and (4) respectively).

Results show that higher academic achievement increases the likelihood of engaging in destructive behavior[14]. Interestingly, the stronger the tights among the participants, the higher the likelihood of destructive behavior.

6.4 Q4: Is destructive behavior more likely to occur if individuals are averse to inequity?

In order to test if destructive behavior is more likely to occur if individuals are averse to inequity, I test two hypotheses:

H6: An individual takes more destructive actions when there are endowment inequalities.

In order to test this hypothesis, I use Activity 5 where endowment inequalities are introduced (i.e., unfair scenario). Individuals that said that it is unfair to receive preferences, in average, took more destructive actions against others, taking more money from others, resulting in a higher burning rate. These differences are significant in every specification for people below the within-group mean.

Moreover, to test if individuals destroy more under an "unfair" scenario compared to a "fair" scenario, I analyze the burning behavior in Activity 3 and 5. I use the following empirical estimation:

$$d_{ijt} = \beta_0 + \beta_1\gamma_1|E_{jt} - E_{it}| + \beta_2\gamma_2|E_{it} - E_{jt}| + \beta_3 E_{it} + \alpha_1\gamma_1|E_{jt} - E_{it}| * T_5 + \alpha_2\gamma_2|E_{it} - E_{jt}| * T_5 \\ +\alpha_3 E_{it} * T_5 + \beta_4 \underline{Z_i} + \beta_5 EXP + \epsilon_{it}$$

where d_{ijt} is the destructive action that agent i takes against agent j in round t and equal to the amount of money taken from others. It is a function of: i) the difference between agent j's earnings and agent i's earnings in the first stage in round t times γ_1 which is equal to 1 if $Y_{jt} > Y_{it}$ and zero otherwise, ii) the difference between agent i's earnings and agent j's earnings in the first stage in round t times γ_2 which is equal to 1 if $Y_{it} > Y_{jt}$ and zero otherwise, iii) agent i's earnings, iv) a set of individual characteristics $\underline{Z_i}$, v) some dummies to control for experimental session, and vi) the interaction of the first three variables with T_5 that is equal to one for activity 5 and zero for activity 3.

[14]This result is contradictory to the findings of Jakiela et al. (2014) who find that higher academic achievement reduces the willingness of young Kenyan women to appropriate other's labor income and concludes that education may have long-run impacts on social preferences, norms, and institutions beyond the human capital directly produced.

A simple t-test of the burning behavior between activity 3 and 5, shows that people took less destructive actions (275 compared to 302) but took more money from others in average (8.5 compared to 7.6 bolivianos) (Table 17, first specification).

Table 18 presents the results of the empirical estimation. Each participant could have taken 4 destructive decisions in activity 3 and 5, so there are a total of 2280 observations. The burning rate (percentage of money a player would like to burn from others) (column (1)) and the amount of money taken from others (column (2)) are regressed on a set of individual characteristics, session fixed effects, and order fixed effects. Since in many cases individuals decide not to burn anything, I use a panel Tobit model with individual-level random effects to control for this censoring problem.

Results suggest that individuals do not behave differently under an unfair scenario. Only absolute negative differences seem to increase burning behavior in a less proportion under an unfair scenario.

H7: An individual takes destructive actions even under complete equality.

In order to test this hypothesis, I use Activity 6 where everybody receives equal earnings regardless of the effort exerted. Individuals that said that it is fair to receive equal earnings regardless of the amount of effort exerted, contrary to one would expect, took more destructive actions against others, taking more money from others, resulting in a higher burning rate. These differences are significant in every specification for people above the within-group mean.

Moreover, to test if individuals destroy less under total equality, where the generation of outcomes could be perceived as unfair, I analyze the burning behavior in Activity 3 and 6. I use the following empirical estimation:

$$d_{ijt} = \beta_0 + \beta_1\gamma_1|E_{jt} - E_{it}| + \beta_2\gamma_2|E_{it} - E_{jt}| + \beta_3 E_{it} + \alpha_1\gamma_1|E_{jt} - E_{it}| * T_6 + \alpha_2\gamma_2|E_{it} - E_{jt}| * T_6 \\ +\alpha_3 E_{it} * T_6 + \beta_4 \underline{Z_i} + \beta_5 EXP + \epsilon_{it}$$

where d_{ijt} is the destructive action that agent i takes against agent j in round t and equal to the amount of money taken from others. It is a function of: i) the difference between agent j's earnings and agent i's earnings in the first stage in round t times γ_1 which is equal to 1 if $Y_{jt} > Y_{it}$ and zero otherwise, ii) the difference between agent i's earnings and agent j's earnings in the first stage in round t times γ_2 which is equal to 1 if $Y_{it} > Y_{jt}$ and zero otherwise, iii) agent i's earnings, iv) a set of individual characteristics $\underline{Z_i}$, and vi) the interaction of the first three variables with T_6 that is equal to one for activity 6 and zero for activity 3.

A simple t-test of the burning behavior between activity 3 and 6, shows that people took less destructive actions (187 compared to 302) but took more money from others in average (9.16 compared to 7.6 bolivianos) (Table 17, first specification). However, when looking at the burning rates, the difference is statistically different from zero and lower under total equality (fourth specification).

Table 19 presents the results of the empirical estimation. Similarly, each participant could have taken 4 destructive decisions in activity 3 and 6, so there are a total of 2280 observations. The burning rate (percentage of money a player would like to burn from others) (column (1)) and the amount of money taken from others (column (2)) are regressed on a set of individual characteristics, session fixed effects, and order fixed effects. Since in many cases individuals decide not to burn anything, I use a panel Tobit model with individual-level random effects to control for this censoring problem.

Results suggest that individuals behave differently under total equality. Their burning behavior is lower overall.

6.5 Q5: Is destructive behavior more likely to occur if individuals are averse to inequality?

There are four ways in which results from the experiment are used to test if destructive behavior is more likely to occur if individuals are averse to inequality:

H8: When destructive behavior takes the form of a progressive taxation and further equal redistribution, individuals take more destructive actions.

In order to test this hypothesis, I use Activity 4 where everybody knew that the money taken from others will be redistributed evenly among everybody. Recall that each participant could have taken 4 destructive decisions, so there are a total of 1140 observations per round. To test if individuals destroy more under the possibility of progressive taxation, I analyze the burning behavior in Activity 3 and 4. I use the following empirical estimation:

$$d_{ijt} = \beta_0 + \beta_1\gamma_1|E_{jt} - E_{it}| + \beta_2\gamma_2|E_{it} - E_{jt}| + \beta_3 E_{it} + \alpha_1\gamma_1|E_{jt} - E_{it}| * T_4 + \alpha_2\gamma_2|E_{it} - E_{jt}| * T_4 \\ +\alpha_3 E_{it} * T_4 + \beta_4 \underline{Z_i} + \beta_5 EXP + \epsilon_{it}$$

where d_{ijt} is the destructive action that agent i takes against agent j in round t and equal to the amount of money taken from others. It is a function of: i) the difference between agent j's earnings and agent i's earnings in the first stage in round t times γ_1 which is equal to 1 if $Y_{jt} > Y_{it}$ and zero otherwise, ii) the difference between agent i's earnings and agent j's earnings in the first stage in round t times γ_2 which is equal to 1 if $Y_{it} > Y_{jt}$ and zero otherwise, iii) agent i's earnings, iv) a set of individual characteristics $\underline{Z_i}$, v) some dummies to control for experimental session, and vi) the interaction of the first three variables with T_4 that is equal to one for activity 4 and zero for activity 3.

A simple t-test of the burning behavior between activity 3 and 4, shows that people took less destructive actions (273 compared to 302) but took more money from others in average (9.42 compared to 7.6 bolivianos) (Table 17, first specification). However, when looking at the burning rates, the difference is not statistically different from zero (fourth specification).

Table 20 presents the results of the empirical estimation.

H9: Individual reduces the outcome of the "richest" individual more than the second richest and so on (i.e., rank egalitarian).

Table 21 presents the burning rates by ranking. The ones that collected the most amount of beans (rank 1) had 98.3% chance to be burned by somebody in their group and in average lost 38.4% of their earnings equivalent to 17.48 bolivianos in total. The total amount of money taken from people rank 1 is statistically different from the amount of money taken from people ranked second and so on except for the last two, showing a rank egalitarian behavior.

Moreover, Table 22 shows the burning behavior by ranking. People ranked 1 do not burn anybody in the same ranking (i.e., they cannot burn themselves), 47.6% of their burning activity is against people ranked # 4 burning 20.9% of their earnings. People ranked 5 burn mostly people ranked number 1 and 2 (41.1% and 31.5%) and burn 18% and 18.3% of their earnings respectively. There is no difference in the percentage burned by ranking, however, in general people take a destructive actions against others highly ranked.

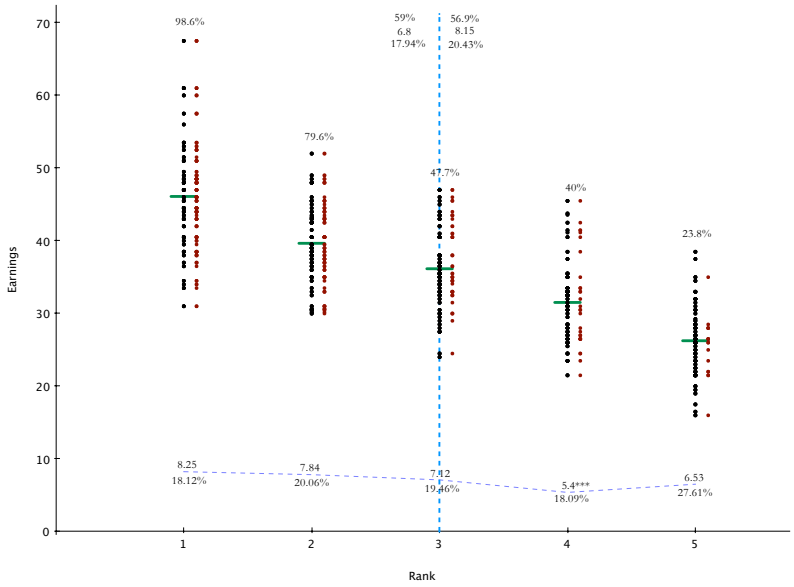


Figure 14: Who suffers? The distribution of earnings is presented by rank, the top number represents the percentage of people in that rank that suffered from burning behavior from others in their group (represented by the red dots), the second number is the average total amount of money that was taken away by others, and the third number is the percentage of their earnings lost due to burning behavior.

H10: Individuals take more destructive behavior as the absolute difference between agent i's earnings and agent j's earnings increases (a la Fehr and Schmidt (1999)).

I test if people who are averse to inequality a la Fehr and Schmidt take more destructive behavior using the following specification:

$$d_{ij} = \beta_0 + \beta_1\gamma_1|E_j - E_i| + \beta_2\gamma_2|E_i - E_j| + \beta_3 E_i + \beta_4 \underline{Z_i} + \beta_5 EXP + \epsilon_i$$

where d_{ij} is the destructive action that agent i takes against agent j and equal to the burning rate. It is a function of: i) the difference between agent j's earnings and agent i's earnings in the first stage times γ_1 which is equal to 1 if $Y_j > Y_i$ and zero otherwise, ii) the difference between agent i's earnings and agent j's earnings in the first stage times γ_2 which is equal to 1 if $Y_i > Y_j$ and zero otherwise, iii) agent i's earnings, iv) a set of individual characteristics $\underline{Z_i}$, and v) some dummies to control for experimental session.

Table 23 presents the results of the empirical estimation. Recall that each participant could have taken 4 destructive decisions in activity 3, so there are a total of 1,140 observations. The burning rate (percentage of money a player would like to burn from others) (column (1) and (2)) and the amount of money taken from others (column (3) and (4)) are regressed on a set of individual characteristics, session fixed effects, and order fixed effects. Since in many cases individuals decide not to burn anything, I use a panel Tobit model with individual-level random effects to control for this censoring problem.

The coefficient of the absolute difference between agent j's earnings and agent i's earnings when $E_j > E_i$ is positive and highly significant (i.e., individuals are averse to disadvantageous inequalities). The richer is agent j compared to agent i, the more destructive behavior agent i will take against agent j. Moreover, contrary to the predictions of Fehr and Schmidt, when agent i is above agent j, agent i still burns making the advantageous inequality even bigger (i.e., some people seem to be driven by the "status seeking" behavior instead of the "guilt" behavior). However, results show that the farther away agent i is from agent j, burning behavior decreases.

Individuals take more destructive behavior as the relative position of the agent i compared to the mean payoff of the other agents increases (a la Bolton and Ockenfels (2000)).

$$d_{ijt} = \beta_0 + \beta_1\gamma_1\left(\frac{E_i}{\sum E_j/n-1}\right) + \beta_2 E_i + \beta_3 \underline{Z_i} + \beta_5 EXP + \epsilon_{it}$$

where d_{ijt} is the destructive action that agent i takes against agent j in round t and equal to the burning rate. It is a function of: i) the relative earnings of agent i ii) agent i's earnings, iii) a set of individual characteristics $\underline{Z_i}$, and iv) some dummies to control for experimental session.

Table 24 presents the results of the empirical estimation. Similarly, there are a total of 1,140 observations. The burning rate (percentage of money a player would like to burn from others) (column (1) and (2)) and the amount of money taken from others (column (3) and (4)) are regressed on a set of individual characteristics, session fixed effects, and order fixed effects. Since in many cases individuals decide not to burn anything, I use a panel Tobit model with individual-level random effects to control for this censoring problem.

The coefficient of the relative earnings is negative and highly significant for both, people that are above the within-group mean and below the within-group mean. These results suggest that when agent i is above the within-group mean, if the ratio of agent i's earnings relative to that of others in their group increases, agent i reduces his burning behavior as predicted by Bolton and Ockenfels (2000). On the other hand, when agent i is below the within-group mean, the closer agent i is to the mean (i.e., his relative earnings increases), agent i also reduces his burning behavior. Therefore, the farther agent i is from the mean, the more destructive behavior he will take.

7 Conclusions and Discussion

As discussed before, one possible explanation behind the protests that *Delizia* encountered when the bonus mechanisms was introduced, is interpersonal comparisons. In particular, the extra effort that one individual exerts increases his individual earnings, however, if others care about their relative position, it may create a negative externality on them, as their relative earnings are lower, and this could lead to destructive behavior within groups. This may be also true in contexts like workplaces, communities, and cooperatives characterized by close interactions among individuals, homogeneity in activities, and heterogeneous and observable outcomes.

I developed a two-stage, two-agent model of strategic behavior that integrates the role of interpersonal comparisons with conventional neoclassical economic preference theory and showed how interpersonal comparisons lead to destructive behavior and affect levels of effort.

The experiment designed to test the predictions of the model and tease out the mechanisms that drive destructive behavior show that intra-group destructive behavior exists, even under a "fair" scenario. For instance, 55% of the participants took at least one destructive action against somebody in their group reducing their earnings by 34%. It seems that an individual-based bonus mechanism, that creates even bigger differences in earnings among individuals within a group or cooperative, can give place to destructive behavior.

However, there should be another way to incentivize dairy farmers to increase the percentage of milk fat. Will competition across groups can eliminate within group burning behavior and incentivize cooperation?

Delizia has a tank in each community where dairy farmers pour their milk. Each tank holds 5,000 liters of milk and is collected twice daily. *Delizia* has an important monetary incentive to pay extra for milk fat at the community level and not at the individual level. Besides the possible destructive behavior that the individual-based bonus can provoke, it is very costly and time consuming to test the percentage of fat in the milk of each dairy farmer. However, if *Delizia* pays extra for milk fat to the entire community, they will have a big problem of free riders. We can think of this as a public good: milk gets mixed in the tank and therefore the milk fat.

Cardenas and Mantilla (2015) run a repeated public good game introducing competition between groups [6]. N participants are divided in 6 fixed groups of size N/6. They play the public good game for 20 rounds. In the last 10 rounds, participants are informed that they are competing against the other groups for a ranking position mapping in a payoffs' multiplier. Their results show decay in contributions in the first 10 rounds that are common in standard PG games, contributing 4.5 of 10 tokens at the beginning and reducing contributions to about 2. When the between-group competition was introduced, contributions rose to 6 tokens and kept increasing to 7.7 tokens.

Will dairy farmers have a similar behavior in a lab game? Will they have a similar behavior in real life? It will be interesting to test if contribution increases under between-group competition using a framed version of this game among dairy farmers.

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8 Appendix

8.1 Tables

Table 1: Who are they?

Variable	Mean	Std. Dev.	Min.	Max.	N
Age last time you where in school	17.004	6.656	4	50	255
Read and write?	0.912	0.283	0	1	285
Head of the Household?	0.653	0.477	0	1	285
# of people that live in the house	4.667	2.097	1	13	285
# of members that contribute to hh income	2.154	1.006	1	8	285
# of rooms in the house	4.018	1.931	1	18	285
# of bedrooms in the house	2.232	1.344	1	10	285
# of kids	2.796	2.396	0	12	285
Competitive? 1 little - 10 a lot	7.227	2.726	1	10	282
Female	0.607	0.489	0	1	285
Age	39.351	16.296	17	82	285
Married	0.758	0.429	0	1	285
Aymara	0.751	0.433	0	1	285
Number of year of education	8.281	4.598	0	17	285
Number of years since last time in school	20.345	17.391	-2	74	255
Own house	0.951	0.217	0	1	285
People per bedroom	2.484	1.286	0.5	9	285

Table 2: What do they do?

Variable	Mean	Std. Dev.	Min.	Max.	N
Direct producer?	0.681	0.467	0	1	285
Number of cows	6.887	4.106	1	37	266
Number of milking cows	2.996	1.638	0	13	266
Income	1855.456	1256.84	1	9000	285
Milk farmer	0.839	0.369	0	1	285
Self-reported liters of milk per cow	10.664	5.592	0	40	266
Percentage of cows that produce milk	0.475	0.221	0	1	266
Income from *Delizia*	1955.939	1680.469	0	9370.275	217

Table 3: Their expectations

Variable	Mean	Std. Dev.	Min.	Max.	N
Minimum earnings per month - beliefs	1159.532	1166.015	0	10000	278
Maximum earnings per month - beliefs	2654.496	1709.093	200	12000	278
Probability that cows produce more milk	0.679	0.236	0.2	1	264
Probability of being the biggest producer in the community	0.571	0.23	0	1	265
Probability of earning half	0.471	0.179	0.2	1	280
Probability of earning double	0.544	0.229	0.2	1	284

Table 4: The experiment

Variable	Mean	Std. Dev.	Min.	Max.	N
# of participants per session	13.87	1.788	9	15	285
Percentage of names that you know	0.820	0.316	0	1	285
Percentage of phone-numbers that you know	0.084	0.172	0	1	284
Percentage of people you will invite	0.625	0.392	0	1	285
Percentage of people you will help	0.3	0.339	0	1	285
Feel envy when someone was above me	0.112	0.316	0	1	285
Feel fear of envy from others	0.256	0.437	0	1	285
Fair to earn more when work more	0.915	0.279	0	1	283
Fair to earn more when work better	0.878	0.328	0	1	279
Fair to earn the same	0.463	0.499	0	1	281
Fair to receive preferences	0.37	0.484	0	1	281

Table 5: Overview

Question	Hypothesis	Activities	# of Observations	Characteristic of the data
Q1	H1	1 and 2	1,140	Panel: $i = 285$, $t = 4$
	H2	1, 2, and 10	1,140	Panel: $i = 285$, $t = 4$
Q2	H3	3	1,140	One burning decision for each member of the group
	H4	1, 2, 3 and 10	1,425	Panel: $i = 285$, $t = 5$
Q3	H5	3	1,140	One burning decision for each member of the group
Q4	H6	3 and 5	2,280	One burning decision for each member of the group in each activity
	H7	3 and 6	2,280	One burning decision for each member of the group in each activity
Q5	H8	3 and 4	2,280	One burning decision for each member of the group in each activity
	H9	3	1,140	One burning decision for each member of the group
	H10	3	1,140	One burning decision for each member of the group
	H11	3	1,140	One burning decision for each member of the group

Table 6: Panel regression model (individual level random effects)

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Experimental Earnings					
T	5.287***	5.298***	1.795***	1.807***	-0.089	-0.064
	(0.424)	(0.441)	(0.392)	(0.408)	(0.463)	(0.473)
Log of round					6.814***	6.795***
					(0.532)	(0.538)
Constant	29.420***	17.019***	32.912***	20.205***	25.350***	13.206***
	(0.755)	(5.102)	(0.914)	(5.821)	(0.653)	(4.643)
Observations	570	566	570	566	1,140	1,132
Number of id	285	283	285	283	285	283
Session FE	NO	YES	NO	YES	NO	YES
Socio-economic Characteristics	NO	YES	NO	YES	NO	YES

Standard errors in parentheses clustered at the session level
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Panel regression model (individual level random effects)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Experimental Earnings					
T=1 and Below the mean	6.312***	6.349***	3.392***	3.440***	1.966***	2.046***
	(0.708)	(0.740)	(0.670)	(0.702)	(0.691)	(0.712)
T=1 and Above the mean	12.942***	12.640***	10.022***	9.830***	-2.188***	-2.188***
	(0.917)	(1.042)	(0.899)	(1.054)	(0.690)	(0.699)
T=0 and Above the mean	8.702***	8.400***	9.859***	9.667***	7.127***	6.789***
	(0.751)	(0.758)	(0.827)	(0.847)	(0.785)	(0.885)
Log of round					5.509***	5.453***
					(0.669)	(0.679)
Above the mean#log of round					2.637***	2.693***
					(0.716)	(0.721)
Constant	25.115***	17.884***	28.035***	20.908***	21.824***	15.235***
	(0.683)	(4.034)	(0.956)	(4.613)	(0.598)	(3.599)
Observations	570	566	570	566	1,140	1,132
Number of id	285	283	285	283	285	283
Session FE	NO	YES	NO	YES	NO	YES
Socio-economic Characteristics	NO	YES	NO	YES	NO	YES

Standard errors in parentheses clustered at the session level
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Positional concerns: survey instrument - Part II

2A		2B		2C		2D		2E	
Hours: 20		Hours: 30		Hours: 40		Hours: 50		Hours: 60	
Earnings: 1250		Earnings: 1875		Earnings: 2500		Earnings: 3125		Earnings: 3750	
Hours	Wage	Hours	Wage	Hours	Wage	Hours	Wage	Hours	Wage
15	937.5	15	937.5	15	937.5	15	937.5	15	937.5
20	1250	20	1250	20	1250	20	1250	20	1250
25	1562.5	25	1562.5	25	1562.5	25	1562.5	25	1562.5
30	1875	30	1875	30	1875	30	1875	30	1875
35	2187.5	35	2187.5	35	2187.5	35	2187.5	35	2187.5
40	2500	40	2500	40	2500	40	2500	40	2500
45	2812.5	45	2812.5	45	2812.5	45	2812.5	45	2812.5
50	3125	50	3125	50	3125	50	3125	50	3125
55	3437.5	55	3437.5	55	3437.5	55	3437.5	55	3437.5
60	3750	60	3750	60	3750	60	3750	60	3750
65	4065.5	65	4065.5	65	4065.5	65	4065.5	65	4065.5

Table 9: Positional concerns: Pingle and Mitchell's (2002) classification

Behavioral Type	Definition	Hours Case Frequency	Percentage
No positional concern	2A=2C=2E	50	17.54
Global Follower	2A<2C<2E	108	37.89
Follow up	2A=2C<2E	36	12.63
Follow down	2A<2C=2E	32	11.23
Global deviant	2A>2C>2E	0	0.00
Deviant up	2A=2C>2E	3	1.05
Deviant down	2A>2C=2E	6	2.11
Follow up, deviant down	2A>2C<2E	38	13.33
Follow down, deviant down	2A<2C>2E	12	4.21

Table 10: Positional concerns: Heterogenous treatment effects

	Behavioral Type	T
Below the Mean	Follower	2.58**
	Below	2.93**
1.96***	Above	1.16
	No positional concern	2.57
Above the Mean	Follower	-2.33**
	Below	-4,20***
-2.18***	Above	-1.3*
	No positional concern	-2.93

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Who burns?

Rank	Takes a destructive action	Amount taken in total	Percentage of earnings spent	% of people that take from somebody above	% of people that take from somebody below	% of people who take from both	% of people who take from same
1	41.7%	10.6	2.4%	0.0%	41.7%	0.0%	0.0%
2	51.8%	12.1	3.1%	50.0%	24.1%	22.2%	3.7%
3	62.5%	13.8	4.0%	59.0%	14.3%	10.7%	5.3%
4	66.1%	17.9	6.0%	66.0%	5.3%	5.4%	1.8%
5	52.5%	17.6	7.1%	52.0%	0.0%	0.0%	0.0%
Below	60.7%	16.4	5.9%	59.3%	4.1%	2.8%	0.6%
Above	48.6%	12.5	3.1%	30.0%	30.7%	12.1%	3.6%
Total	54.7%	8.0	4.7%	44.9%	17.2%	2.1%	2.1%

Table 12: Panel regression model (individual level random effects)

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Experimental Earnings					
T2			1.795***	1.807***	-0.089	-0.064
			(0.392)	(0.404)	(0.463)	(0.472)
T3	1.111***	1.090***	2.905***	2.898***	-0.499	-0.490
	(0.392)	(0.410)	(0.571)	(0.587)	(0.710)	(0.716)
Log of round					6.814***	6.795***
					(0.532)	(0.537)
Constant	34.707***	25.761***	32.912***	22.767***	25.350***	14.633***
	(0.843)	(6.132)	(0.914)	(5.567)	(0.653)	(4.692)
Observations	570	566	855	849	1,425	1,415
Number of id	285	283	285	283	285	283
Session FE	NO	YES	NO	YES	NO	YES
Socio-economic Characteristics	NO	YES	NO	YES	NO	YES

Standard errors in parentheses clustered at the session level
*** p<0.01, ** p<0.05, * p<0.1

Table 13: Panel regression model (individual level random effects)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Experimental Earnings					
T2=1 and Below the mean			3.392***	3.440***	1.966***	2.046***
			(0.670)	(0.696)	(0.691)	(0.710)
T3=1 and Below the mean	0.997	0.954	4.389***	4.394***	1.733**	1.783**
	(0.741)	(0.773)	(0.721)	(0.747)	(0.828)	(0.844)
T2=1 and Above the mean			11.412***	11.108***	-2.188***	-2.188***
			(1.296)	(1.376)	(0.690)	(0.697)
T3=1 and Above the mean	7.857***	7.402***	0.000	0.000	-2.779***	-2.779***
	(1.313)	(1.192)	(0.000)	(0.000)	(0.874)	(0.884)
T2=0 and Above the mean			11.249***	10.945***		
			(1.004)	(1.009)		
T3=0 and Above the mean	6.630***	6.175***	-1.390*	-1.390*		
	(1.280)	(1.218)	(0.731)	(0.744)		
Above the mean					7.127***	6.742***
					(0.785)	(0.898)
Log of round					5.509***	5.453***
					(0.669)	(0.677)
Above the mean#Log of round					2.637***	2.693***
					(0.716)	(0.719)
Constant	31.427***	27.023***	28.035***	23.136***	21.824***	16.473***
	(1.142)	(5.455)	(0.956)	(4.566)	(0.598)	(3.723)
Observations	570	566	855	849	1,425	1,415
Number of id	285	283	285	283	285	283
Session FE	NO	YES	NO	YES	NO	YES
Socio-economic Characteristics	NO	YES	NO	YES	NO	YES

Standard errors in parentheses clustered at the session level
*** p<0.01, ** p<0.05, * p<0.1

Table 14: Positional concerns

	Behavioral Type	T2	T3	Diff
Below the Mean	Follower	2.58**	2.56*	-0.02
	Below	2.93**	4.07**	1.14
1.96***	Above	1.16	1.21	0.05
	No positional concern	2.57	0.47	-2.1
Above the Mean	Follower	-2.33**	-4.67***	-2.34**
	Below	-4,20***	-1.75	2.45
-2.18***	Above	-1.3*	-2.03	-0.73
	No positional concern	-2.93	-1.96	0.97

*** p<0.01, ** p<0.05, * p<0.1

Table 15: Destructive behavior and positional concerns

			(1)	(2)
		Behavioral Type	Take	% Take
Below the Mean	Positional Concern	Follower	0.520	6.198
		Below	0.889	8.452
0.486 / 6.237	0.615 / 6.128	Above	0.651	5.741
	No positional concern			
	0.565 / 6.817			
Above the Mean	Positional Concern	Follower	0.622	3.703
		Below	0.733	8.138
0.607** / 4.005***	0.531 / 4.424	Above	0.426	3.948
	No positional concern			
	0.296** / 2.250**			

*** p<0.01, ** p<0.05, * p<0.1

Table 16: Marginal effects on the likelihood of destructive behavior (Logit MLE)

	(1) Take $Diff_{i,j} < 0$	(2) Take $Diff_{i,j} > 0$	(3) Take $Diff_{i,mean} < 0$	(4) Take $Diff_{i,mean} > 0$
Earnings$_i$	-0.002	-0.001	-0.000	0.000
	(0.005)	(0.002)	(0.014)	(0.013)
Female	0.033	0.076***	-0.024	0.476***
	(0.073)	(0.028)	(0.209)	(0.146)
Age	-0.020***	-0.006**	-0.021	-0.050**
	(0.007)	(0.003)	(0.019)	(0.024)
Married	0.132	0.008	-0.106	0.309**
	(0.085)	(0.025)	(0.206)	(0.151)
Aymara	0.121**	-0.003	0.465***	-0.198
	(0.058)	(0.021)	(0.152)	(0.156)
Years of education	0.042***	0.009**	0.026	0.102**
	(0.013)	(0.004)	(0.035)	(0.040)
Years since last time in school	0.016**	0.009***	0.004	0.057**
	(0.007)	(0.003)	(0.019)	(0.025)
Dairy farmer	0.091	0.010	0.212	-0.117
	(0.087)	(0.030)	(0.241)	(0.230)
Head of the household	-0.031	-0.002	0.282	0.043
	(0.082)	(0.021)	(0.249)	(0.190)
Log of self reported income	0.076*	0.007	0.171*	-0.021
	(0.043)	(0.012)	(0.102)	(0.098)
Own house	-0.169	-0.301*	-0.134	-0.191
	(0.130)	(0.173)	(0.248)	(0.264)
People per bedroom	-0.052**	-0.003	-0.110**	0.025
	(0.021)	(0.007)	(0.051)	(0.048)
High rank	0.344***	0.139**	-0.597***	-0.205
	(0.047)	(0.066)	(0.141)	(0.182)
Low rank	-0.088	-0.091***	-0.204	
	(0.092)	(0.033)	(0.136)	
Social capital	0.273*	0.050	1.077***	0.258
	(0.159)	(0.055)	(0.387)	(0.436)
Observations	505	431	122	106
Session FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 17: T-test

Variable	Activity	Observations	Mean	Difference with respect to Activity 3
Take	3	302	7.593	
	4	273	9.424	1.832***
	5	275	8.486	0.893*
	6	187	9.16	1.567***
%Take	3	302	19.405	
	4	273	23.043	3.638***
	5	275	17.91	-1.489
	6	187	25.319	5.913***
Take	3	1140	2.011	
	4	1140	2.257	0.245
	5	1140	2.047	0.0357
	6	1140	1.503	-0.509***
%Take	3	1140	5.141	
	4	1140	5.518	0.377
	5	1140	4.322	-0.819*
	6	1140	4.153	-0.987**

*** p<0.01, ** p<0.05, * p<0.1

Table 18: Panel tobit model (individual level random effects)

	(1)	(2)
Variable	%Take	Take
Absolute diff above in Act 3	-0.610**	-0.326***
	(0.282)	(0.120)
Absolute diff above in Act 5	-0.063	-0.084
	(0.205)	(0.086)
Absolute diff below in Act 3	0.547***	0.335***
	(0.196)	(0.082)
Absolute diff below in Act 5	0.241**	0.214***
	(0.117)	(0.048)
Earnings in Act 3	0.233	0.192**
	(0.211)	(0.089)
Earnings in Act 5	-0.037	0.049
	(0.164)	(0.068)
Constant	-60.641***	-28.579***
	(16.644)	(6.953)
Observations	2,016	2,016
Number of idn	1,008	1,008

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 19: Panel tobit model (individual level random effects)

Variable	(1) %Take	(2) Take
Absolute diff above in Act 3	-1.270***	-0.569***
	(0.356)	(0.134)
Absolute diff above in Act 6	-0.346**	-0.153**
	(0.164)	(0.062)
Absolute diff below in Act 3	1.131***	0.539***
	(0.256)	(0.095)
Absolute diff below in Act 6	0.269**	0.094**
	(0.111)	(0.041)
Earnings in Act 3	0.790***	0.400***
	(0.256)	(0.096)
Earnings in Act 6	-0.796**	-0.156
	(0.388)	(0.143)
Constant	-76.017***	-32.181***
	(21.477)	(7.999)
Observations	2,016	2,016
Number of idn	1,008	1,008

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 20: Panel tobit model (individual level random effects)

Variable	(1) %Take	(2) Take
Absolute diff above in Act 3	-1.105***	-0.505***
	(0.324)	(0.128)
Absolute diff above in Act 4	-0.555*	-0.324***
	(0.297)	(0.119)
Absolute diff below in Act 3	0.858***	0.460***
	(0.227)	(0.089)
Absolute diff below in Act 4	0.803***	0.492***
	(0.201)	(0.079)
Earnings in Act 3	0.636***	0.353***
	(0.235)	(0.092)
Earnings in Act 4	0.101	0.175**
	(0.222)	(0.087)
Constant	-77.684***	-33.640***
	(18.413)	(7.251)
Observations	2,016	2,016
Number of idn	1,008	1,008

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 21: Inequality aversion

Rank	Probability of being burned	Amount taken in average	Percentage of income burned
1	98.3%	17.48	38.4%
2	79.6%	14.38	36.7%
3	48.2%	11.13	30.5%
4	39.3%	6.73	22.9%
5	23.7%	7.93	33.5%
Below	33.8%	7.73	26.91%
Above	82.9%	15.78	37.3%
Total	57.9%	13.4	34.2%

Table 22: Who burns, who suffers?, by ranking

Rank		1	2	3	4	5	Total
1	(1)	0	20.9%	16.0%	13%	21.0%	18.0%
	(2)	0	47.6%	21.4%	24%	7.1%	42
2	(1)	15.4%	0	18.4%	28%	20.0%	17.6%
	(2)	57.1%	0	26.5%	8%	8.2%	49
3	(1)	17.6%	17.7%	0	17%	30.2%	18.7%
	(2)	50.0%	20.3%	0	11%	9.1%	66
4	(1)	21.0%	23.1%	26.1%	0	36.2%	23.3%
	(2)	47.2%	31.9%	15.3%	0	5.6%	72
5	(1)	18.0%	18.3%	17.0%	19.7%	0	18.1%
	(2)	41.1%	31.5%	16.4%	11.0%	0	73
% burned		98.3%	79.6%	48.2%	39.3%	23.7%	

(1) Burning Rates
(2) Distribution of burning behavior

Table 23: Absolute income differences: Tobit model (individual level random effects)

	(1) % Taken	(2) % Taken	(3) Take	(4) Take
Absolute diff below	0.924***	0.718***	0.406***	0.372***
	(0.172)	(0.234)	(0.063)	(0.087)
Absolute diff above	-1.054***	-0.512	-0.402***	-0.256**
	(0.236)	(0.320)	(0.088)	(0.120)
Earnings_i		0.296		0.203**
		(0.252)		(0.094)
Constant	-20.086***	-55.334***	-7.535***	-24.306***
	(2.365)	(19.514)	(0.869)	(7.310)
Observations	1,140	1,008	1,140	1,008
Session FE	NO	YES	NO	YES
Socio-economic Characteristics	NO	YES	NO	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 24: Relative income differences: Tobit model (individual level random effects)

	(1) % Taken	(2) % Taken	(3) Take	(4) Take
Relative earnings above mean	-19.546***	-14.930	-8.139***	-7.823
	(6.281)	(12.545)	(2.379)	(4.764)
Relative earnings below mean	-20.032**	-23.982*	-8.492**	-11.308**
	(9.544)	(14.505)	(3.611)	(5.503)
Earnings_i		-0.138		0.020
		(0.385)		(0.146)
Constant	0.138	-19.601	0.969	-7.844
	(7.524)	(18.378)	(2.846)	(6.969)
Observations	1,140	1,008	1,140	1,008
Session FE	NO	YES	NO	YES
Socio-economic Characteristics	NO	YES	NO	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1