Catching Up or Pulling Down?
Interpersonal Comparisons and Destructive Actions
Experimental Evidence from Bolivia

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Abstract

Interpersonal comparisons with those who are relatively better off can spur individuals to increase effort or investment to "catch-up" or to "pull-down" others through harmful actions. While destructive behavior directly reduces welfare, it can also indirectly reduce output and welfare if perceived threats induce ex-ante behavioral responses such as lower levels of effort and investment. In order to empirically examine how interpersonal comparisons, along with the prevalence of destructive actions, influence effort levels, this paper presents the results from a unique experimental design that builds on the two-stage "money burning" game. The experimental games were conducted in Bolivia among 285 dairy farmers. Results show that when participants were presented with their ranking and the earnings of others in their group, those below the group mean increased their effort whereas those above the group mean decreased their effort. When destructive actions were allowed, 55 percent of the participants were willing to forego own-consumption in order to burn others' output; 58 percent were victims of destructive actions and lost, on average, a third of their earnings. There is an asymmetry in the direction of destruction: almost all of the highest earners suffered some destruction while only a quarter of the lowest earners were victims of destructive actions. Finally, the threat of destructive actions reduced the highest earning participants' effort by 5.8 percent.

JEL Classifications: D03, D63

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"Envy is the great leveler: if it cannot level things up, it will level them down" (Dorothy Sayers, 1941)

1 Introduction

Being part of a close-knit social group is often associated with cooperation, trust, and reciprocity amongst group members. While the influence of these positive social preferences on important development outcomes amongst low-income close-knit communities has been widely examined,[1] little attention has been given to the dark side of these social interactions and their impact on social and economic outcomes. Destructive action –such as pulling down more successful individuals within a group– can potentially offset the positive aspects of belonging to a close-knit group and limit the effectiveness of development initiatives targeting such social groups. In this paper, I empirically explore the prevalence of destructive behavior due to interpersonal comparisons amongst close-knit social groups.

Many studies have found that the welfare of individuals is affected not only by the absolute amount of resources at their disposal but also by their relative position vis-a-vis others (Luttmer [2005]; Veblen [1899]; Duesenberry [1949]; Pingle and Mitchell [2002]; Ravallion and Lokshin [2010]; Solnick and Hemenway [2005]). These interpersonal comparisons with others in the surrounding environment and concerns with relative social position may influence individuals' choices and can affect behavior. Interpersonal comparisons can affect decisions regarding where to work and live (Frank [1985]; J Solnick and Hemenway [1998]; Tversky and Griffin [1991]; Johansson-Stenman et al. [2002]) and affect social contributions, cooperation, and risk taking behavior (Fafchamps and Shilpi [2008]; Parks et al. [2002]; Hill and Buss [2010]). In addition, such comparisons can spur individuals to increase effort or investment to "catch-up", or to "pull-down" others through harmful actions, even if these actions are as costly to themselves as well as their peers. In this paper, I study these two possible reactions to interpersonal comparisons.

On one hand, when individuals are concerned with their relative social position, interpersonal comparisons can lead individuals to incur a cost in order to improve one's own position relative to others who are ahead of them in the form of increased effort levels. The "keeping-up-with-the-Joneses" effect has been widely studied in the literature and has been found to act as a stimulus to work harder (Bowles and Park [2005] ; Schor [2008]; Neumark and Postlewaite [1998]), increase effort towards human capital enhancement, and mimic patterns of consumption observed in higher income individuals (Hoover and Kimbrough [2014]). However, interpersonal comparisons has also been found to be correlated with a decrease in in-

[1]For instance, low default rates in group lending has been attributed to harness existing trust and cooperation among groups; trust and reciprocity are key for informal risk sharing that ultimately promote investment (De Weerdt and Dercon [2006]; Fafchamps and Gubert [2007]).

dividuals' performance and effort (Ashraf et al. [2014]) due to frustration and resignation (Torgler et al. [2006]; Frey et al. [2013]).

On the other hand, individuals can also improve their position relative to others by destroying some of the others' assets, even if such action carries its own costs (Van de Ven et al. [2009]; Zeckhauser [1991]; Miceli and Castelfranchi [2007]). For instance, Zizzo and Oswald (2001) performed an experiment where people can burn other subjects' money at their own cost and found that about two thirds of the subjects spend their money to hurt other people. Destructive behavior directly reduces welfare as output is destroyed and can have serious implications for a number of areas of interests to economists, such as bargaining, human welfare, firm structure, inter-industry wage differentials, consumption and taxation, economic growth, and cooperation (Zizzo [2008]; Beckman et al. [2002]; Parks et al. [2002]). For example, in a previous work with women's weaving cooperatives in Bolivia, I observed that when payments were based on an individual's productivity, less productive members publicly chastised and even expelled members with higher productivity even though that action jeopardized the cooperative's ability to meet work targets. Mui (1995) tells the story of a Chinese peasant whose success provoked fellow villagers to steal the timber of his new house, kill his pregnant cow, and poison two of his goats and some of his hens.

Furthermore, destructive behavior can reduce output and welfare indirectly if perceived threats induce ex-ante behavioral responses such as lower levels of effort and investment. When individuals abstain from behavior that could provoke "envy" from others, individuals may be discouraged from adopting new technologies, or engaging in entrepreneurship (Elster [1991]). Individuals may be afraid to engage in productive economic activity for fear of social backlash and retaliation (Grolleau et al. [2006]) and conform to prevailing norms in order to avoid social penalties (Bursztyn and Jensen [2014]). In this paper, I analyze how the threat of destructive actions affect effort levels.

Interpersonal comparisons with those who are relatively better off may not only affect effort levels, but may also lead to destructive actions. Destructive actions directly reduce welfare and it can also indirectly reduce welfare if perceived threats induce ex-ante behavioral responses in the form of lower levels of effort. This paper is the first one to combine these key insights from the literature and examine them empirically using an innovative experimental design that was carried out among close-knit social group in developing settings. The findings of this paper may shed light onto efficiency and productivity implications of interpersonal comparisons and destructive behavior in relevant populations. I first explore the degree to which interpersonal comparisons directly affect effort levels. I then analyze the direct consequences of destructive actions, defined as destroying others' output, on welfare. Finally, I look at the indirect effect

of destructive actions on effort.

In order to empirically examine how interpersonal comparisons, along with the prevalence of destructive actions, influence effort levels, I designed an experiment that builds on the two-stage "money burning" game of Zizzo and Oswald (2001) where I introduce a simple effort task to measure not only the prevalence of destructive behavior but also its effect on effort. The experimental games were carried out in Bolivia with 285 dairy farmers. I find that when participants were presented with their ranking and the earnings of others in their group, results suggest that people conform to the group mean. Those below the group mean increased their effort by 6% whereas those above the group mean decreased their effort by 6%. When I allow for destructive actions, this effect is lower for those below the group mean (5%) and higher for those above the group mean (8%). Out of all the participants, 55% are willing to forego some of their own consumption in order to burn others' output; 58% were victims of destructive actions and lost approximately a third of their earnings, on average. There is an asymmetry in the direction of destruction – while almost all of the highest earners suffered some destruction, only a quarter of the lowest earners were victims of destructive actions. Finally, the threat of destructive actions reduced highest earners' effort by 5.8%.

The following section introduces the conceptual framework of the impact of interpersonal comparisons on effort levels, and how they can result in destructive actions. The experimental protocol is described in section 3. Section 4 presents the results from the experiment conducted among dairy farmers in Bolivia and conclusions are discussed in section 5.

2 Conceptual Framework: An Interpersonal Utility Function

In this section I introduce the experimental conceptual framework through a simple utility function that illustrates how interpersonal comparisons may affect individuals' welfare, influence effort levels, and lead to destructive behavior.

Consider two agents, i and j. Let the utility of agent i be equal to:

$$U^i(C_i, e_i, C_j; \theta_i^a, \theta_i^b, \alpha) = C_i(e_i) - \theta_i^a \max[C_j(e_j) - C_i(e_i), 0] - \theta_i^b \max[C_i(e_i) - C_j(e_j), 0] - e_i^2$$

where

$$C_i = e_i\beta_i - \gamma d_i - \tau d_j^{0.5} \text{ and } C_j = e_j\beta_j - \gamma d_j - \tau d_i^{0.5}$$

where C_i and C_j are the consumption levels of agent i and j respectively, e_i is the effort exerted by agent i, θ_i^a is a parameter measuring the impact of a consumption deficit of i vis-a-vis j, and θ_i^b does the same for a consumption advantage of i vis-a-vis j. This utility function modifies Fehr and Schmidt's (1999) inequality aversion preferences by adding disutility of effort, which is the main input to produce output that ultimately generates utility through consumption.

The consumption levels of agent i depends on effort, e_i; β_i represents agent i's production efficiency; γd_i is the cost of destructive action, d_i, against agent j and equal to the amount of own output sacrificed to destroy agent j's output; τd_j is the amount of agent i's outcome that is destroyed when agent j chooses d_j as the intensity of destruction.[2]

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), and 2) the sign and magnitude of the positional concern parameters θ_i^a and θ_i^b. On one hand, if agent i's consumption is less than agent j's, and agent i is concerned with his relative position, agent i suffers disutility generated from agent j's superiority.[3] In this case, an increase in agent j's consumption generates a negative externality for agent i because it lowers agent i's relative consumption (Luttmer [2005]; Banerjee [1990]). If individual i derives disutility from being behind agent j, he can take two actions: 1) he can exert more effort to "catch-up" with agent j, or 2) he can destroy some of agent j's earnings, even if such action carries its own costs. Either way, agent i is reducing his disadvantageous difference and therefore increases his utility.

On the other hand, if agent i's consumption is higher than agent j's, agent i may suffer disutility from his superiority (the "guilt" case) or agent i may gain utility if he enjoys being ahead of others (the "status

[2]For a full description of the model and optimality conditions, please refer to Zeballos and Boucher (2015)

[3]The disutility generated from the positive difference between C_j and C_i can be thought as inequity / inequality aversion (Fehr and Schmidt [1999]), or envy (Mui [1995]; Varian [1974]).

seeking" case (Frank [1985])). In the former case, agent i may exert less effort to reduce this difference and he will never take a destructive action. In the latter, agent i can either exert more effort or he can destroy agent j's earnings to increase this advantageous difference. The cost and technology of destruction are key parameters to decide whether or not destruction is beneficial and if so, to determine the optimal level. I define both parameters explicitly in the experimental game.

The impact of a given shortfall or surplus will depend on key parameters, such as θ^a and θ^b, which will be measured in the experimental game. As presented above, when an individual is concerned with his relative position (i.e., $\theta^a \neq 0$ and/or $\theta^b \neq 0$), interpersonal comparisons can impact effort and/or lead to destructive actions. I will classify individuals into one of the following categories according to their behavior in the game: malicious, status-seeking, guilt, envy, or catching-up. When agent i's consumption is lower than agent j's, agent i can exert more or less effort. If he exerts more effort and does not take a destructive action, I will define agent i as *catching-up* with agent j. However, if agent i takes a destructive action he will be defined as *envious*, and this will also be true whether he exerts equal or less effort. The case in which agent i derives utility from being below is represented by the fourth category: agent i exerts same or lower effort and does not take a destructive action (i.e., θ^a is negative) and I define it as *underachiever*, although this may not be the appropriate word to describe the people under this category. When agent i's consumption is higher than agent j's, agent i can also exert more or less effort. If he exerts more effort, I will define agent i as *malicious* if also takes a destructive action and *status-seeker* if he does not. If agent i exerts same or less effort and takes a destructive action he will be defined as being *fearful of envy*, and have *guilt* about being above agent j if he does not take a destructive action. Table 1 summarizes how I classify individuals into one of these categories. The experimental game presented in the following section is designed to categorize each participant into one behavioral type according to their reactions when presented with their ranking in the group and I allow for destructive behavior.

Table 1: Interpersonal Comparisons, Effort, and Destructive Behavior

Direction of comparison	Effort of agent i after comparisons	Destructive Action of i on j	Behavioral type of i	Positional Concern Parameter
$C_i < C_j$	Higher	YES	Envy	$\theta_i^a > 0$
		NO	Catch up	$\theta_i^a > 0$
	Same or lower	YES	Envy	$\theta_i^a > 0$
		NO	Underachiever	$\theta_i^a < 0$
$C_i > C_j$	Higher	YES	Malicious	$\theta_i^b < 0$
		NO	Status Seeking	$\theta_i^b < 0$
	Same or lower	YES	Fear of Envy	$\theta_i^b > 0$
		NO	Guilt	$\theta_i^b > 0$

3 Behavioral Experiment

The experimental game empirically examines how interpersonal comparisons affect effort levels, the prevalence of destructive actions, and how the threat of destructive actions affects effort levels. The experimental design builds on the two-stage "money burning" game of Zizzo and Oswald [2001], which has 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 replace Zizzo and Oswald's 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 of beans and rice.This effort task is similar to others found in the literature such as stuffing and folding envelops, that are less likely to be affected by cognitive ability than other effort tasks such as adding numbers, answering a quiz, or solving a maize.

I introduce this effort task for two main reasons. First, I intent to measure the effect of interpersonal comparisons on effort and test whether destructive actions affect effort. Second, I am interested in testing the prevalence of destructive behavior in contexts in which people exert effort to generate outcome that may be different from other contexts in which outcome is generated by luck. Individuals in many experimental games react differently when income is earned versus when is randomly assigned to them. For instance, in ultimatum games, 95% of the dictators follow game-theoretic predictions by not transferring

any amount to the other player when they earned their wealth (Cherry et al. [2002]) compared to when money is not earned, in which participants are more likely to share the initial endowment equally (Güth et al. [1982]; Güth and Tietz [1988]). In charitable giving games, participants tend to give less when income is earned than when income is unearned (Reinstein and Riener [2012]). Therefore, destructive behavior may also be lower when outcome is earned as individuals recognize merit compared to a situation in which money is generated by luck.[4]

3.1 Experimental Site

The game sessions were carried out with members of dairy cooperatives in the Altiplano of Bolivia. Carrying out this experiment among members of a dairy cooperative can shed light on efficiency and productivity implications of destructive behavior in which these concerns can been shown to have significant impacts. For instance, in 2012 dairy farmers in this region protested against a bonus reward program offered by *Delizia* (an ice-cream factory that works with approximately 2,700 dairy farmers in Bolivia) designed to increase the percentage of milk fat from 3.5% to 4%. Farmers argued for equal prices on the principle of equality among people and disliked this form of price discrimination, resulting in the abolition of this award program and the incentive to produce better quality of milk. Dairy farmers that invested in feeding technology to increase the percentage of milk fat were negatively affected by the actions of others, as they no longer receive direct returns on this investment. In the aftermath, Felipe Vera Loza, the CEO of *Delizia* stated he "know(s) that in the future we can never establish a payment for quality, or for higher milk volume. Dairy farmers believe that everybody should receive the same".

3.2 Participants

The experiments were carried out among 19 factory workers of *Delizia* and 266 dairy farmers from four communities located close to La Paz that supply milk to *Delizia*.[5] Therefore, of all the participants in the experiment, 84% are dairy farmers and 81% of them supply milk to *Delizia*.

[4]In the pilot study, I had an activity in which earnings were determined by rolling a 6-sided die. Destructive behavior was 17% higher in this activity compared to a situation in which income was generated through the effort task.

[5]The initial plan was to carry out the experiment among 150 factory workers and 150 dairy farmers, however due to low participation rate among factory workers, the rest of the experimental session were run among dairy farmers. The results presented in section 4 still hold when I exclude the factory workers.

In each community, the majority of active members of the cooperative participated in the experimental sessions. In order to fill the minimum requirement of participants in each session, other dairy farmers in the community were invited to participate in the session that are not formally members of the cooperative (e.g. family members who are dairy farmers).

The majority of dairy farmers in the Bolivian altiplano are small scale producers with 10 cows at most. The participants in the experiment have on average 7 cows, approximately half of which actively produced milk at the time of the interview. Their average self-reported daily production of milk is 10.66 liters per cow, and monthly earnings are around US$ 271, slightly less than the US$ 302 average monthly payments over the past 12 months reported by *Delizia*. Their monthly earnings are about a third higher than the minimum wage in Bolivia.

Participants were on average 40 years old, 60.7% are female and have, on average, 8.3 years of schooling. Nearly two-thirds of the participants report being the head of the household (48% are female). Most of the participants own a house (95%) and on average 4.6 people live in the house (2.8 are kids). Almost half of the household members contribute to the household income. An average house has 4 rooms, and half of these are used to sleep resulting in a 2.48 person-per-room ratio (Table 2). Participants came from relatively close-knit communities. On average, participants knew 82% of the names of the participants in their session, they would invite 62.5% of them to their house for a special occasion, and would help 30% of the individuals in the session.

Table 2: Who are the Participants and What Do they Do? Summary Statistics

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Female (fraction)	0.607	0.489	0	1	285
Age	39.351	16.296	17	82	285
Married (fraction)	0.758	0.429	0	1	285
Number of year of education	8.281	4.598	0	17	285
Know how to read and write (fraction)	0.912	0.283	0	1	285
Number of years since last time in school	20.373	17.357	0	74	255
Head of the Household (fraction)	0.653	0.477	0	1	285
Own house (fraction)	0.951	0.217	0	1	285
People per bedroom	2.484	1.286	0.5	9	285
# of members that contribute to hh income	2.154	1.006	1	8	285
Milk farmer (fraction)	0.839	0.369	0	1	285
Direct producers (fraction)	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
Self-reported liters of milk per cow	10.664	5.592	0	40	266
Cows that produce milk (fraction)	0.475	0.221	0	1	266
Income in US$	270.81	181.38	14.49	1304.35	283
Income from Delizia	302.14	256.82	0	1401.02	217

3.3 Experimental Design

In each experimental session, individuals participated in 10 activities that were structured to test a range of hypotheses and to control for order effects. In this paper I only use data from 4 activities[6] that will be described later in this section. After completing all 10 activities, the participants filled out a questionnaire that collected information on participants' social economic characteristics, their familiarity with all other participants in their session, and feelings such as satisfaction or envy provoked by their experience in the game. In order to ensure independence between activities, after the questionnaire was completed, one of the 10 activities was randomly selected by each participant. Their monetary earnings were based on this randomly selected activity. Since participants did not know which activity will determine their final earnings, there was an incentive to perform equally well in each activity. The sessions lasted, on average, three and a half hours.

I carried out 21 sessions with 10 or 15 participants in each session.[7] At the beginning of each session, individuals were randomly assigned to a group containing a total of 5 members. The identity of the other 4 group members remained a secret – although the participants in a session can see each other, their group composition was kept unknown at all times.

3.3.1 Description of Activities

In this paper I use data from activities 1, 2 and 3, which were always conducted in the same order, and from activity 10, which was always played at the end and I will call it activity 4 from now on. Group composition was maintained throughout activities 1 to 3 to increase the number of independent observations and improve statistical power. Activity 4 was played individually.

Activity 1. Baseline Effort Elicitation: Each individual received a bucket with 2 cups of rice and 1 cup of beans and was asked to separate and collect as many beans as possible in one minute. Participants received 50 cents of Bolivian Boliviano (BOB) valued at about US$ 0.072 [8] per gram of beans collected.

[6]The other activities were designed to test the underlying motivations of destructive behavior in which I introduce alternative scenarios in the second stage that vary the incentive to burn money. In particular, I test the degree to which the level of destruction actions vary across three motivations: Envy, inequality aversion, and inequity aversion [Zeballos, 2015].

[7]In one fourth of the sessions, there were less than the required number of participants (i.e., 10 or 15) because some dairy farmers did not understand Spanish and could not participate in the game. In order to have groups containing always a total of 5 members, I created ghosts in the game whose earnings were always equal to the average of the first three participants in the group. Since participants were not informed of the identity of others in the group they did not know if they were playing with a ghost or not.

[8]Exchange rate: 6.90 BOB per 1 USD

Participants repeated the effort task 3 times, after which each participant was privately informed of their earnings in each round and their final earnings for this activity, which was equal to the average earnings across all three rounds. Figure 1 presents the final earnings in activity 1, which generated a normal distribution of earnings with a mean of US$ 4.3. The variability in the experimental earnings is essential to analyze whether positional concerns and the presence of destructive actions, influence effort levels.

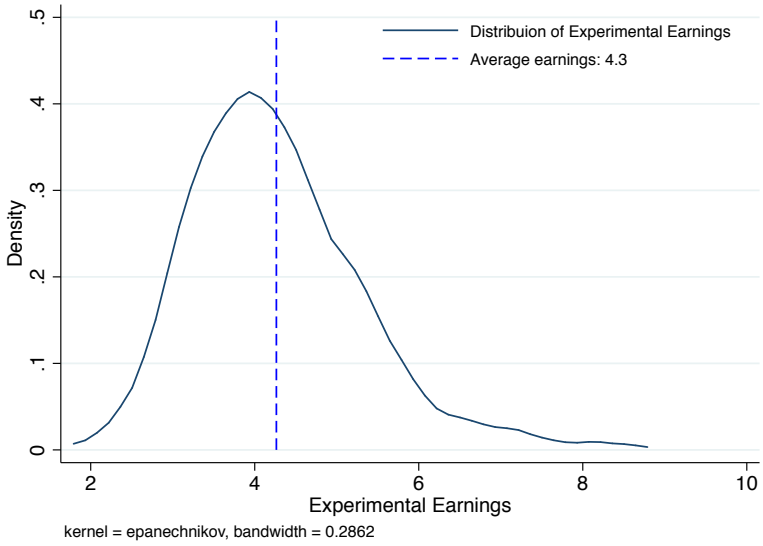

Figure 1: Distribution of final earnings in Activity 1

Activity 2. Positional Concerns and Effort Levels: At the beginning of the activity, game staff presented each group member the final earnings from activity 1 of others in their group in descending order (1 being the person that earned the most in the group, and 5 the person that earned the least). Own earnings and ranking were highlighted so each participant knew their own ranking in their group. Each individual thus knew his average earnings and position in the group, the average earnings of all their group members, but not the identity of the individual at each position in the ranking. The identity of the group members was kept anonymous throughout the session. After learning about others' earnings and their ranking in the group, participants played the effort task again for one round. In combination with activity 1, this activity will allow examining the impact of increasing interpersonal comparisons on effort levels by showing each participant their ranking and the earnings of other members in their group.

Activity 3. Introduction of Destructive Behavior: In this activity, participants played the two - stage money burning game:

Betting Stage: Participants played the effort task for one round to generate variation in participants' earnings.

Burning Stage: After all individuals were informed of other participants' earnings and the anonymous rankings in the group, all 5 group members were asked to decide whether and how much they wanted to pay to reduce part of other group members' 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, so individuals paid one cent BOB for every ten cents reduction inflicted on another participant[9].

Before making their decisions, all participants knew that while everyone made money-burning choices, only one choice was going to be implemented to determine final winnings for each participant. As such, although the total money burning amounts are recorded, only the choices of a random dictator determine the actual money to be burnt. The randomly chosen dictator was kept anonymous throughout the session to avoid possible retaliation within and outside the game. This modified design enabled subjects to determine how much money they want to burn as an individual choice task while preventing outcomes below zero (Zizzo [2003]).

This activity will be used to determine the prevalence of destructive behavior under equal endowment and similar conditions. Moreover, in combination with activity 1 and 2, this activity allows determining whether the presence of destructive behavior has an effect on effort levels.

Activity 4. Positional Concerns: This activity aims to evaluate whether θ^a and θ^b are equal to zero (i.e., no positional concerns) or if they are different from zero, in which case I determine if the participant prefers earning less than, more than, or the same as others around. I replicated the survey instrument constructed by Pingle and Mitchell (2002) in which participants role played according to a series of hypothetical labor market situations. Participants engaged in a series of two rounds: 1) a labor-leisure choice problem, and 2) a positional concerns problem in which the wages of others were held fixed but the work hours of others varied.

In the first round, participants are presented with Table 3. In this hypothetical economy there are 11 pairs of hour-wage decisions to choose from. They have to choose their preferred labor-leisure combination.

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

Table 3: Survey Instrument - Part I: A Labor-Leisure Choice Problem

Hours	Wage
15	937.5
20	1250.0
25	1562.5
30	1875.0
35	2187.5
40	2500.0
45	2812.5
50	3125.0
55	3437.5
60	3750.0
65	4065.5

In the second round, participants choose their preferred work-income combination under hypothetical situations with different combinations of work-income for others around them. Specifically, participants were asked to complete Table 4 that contains five hypothetical economies. In each hypothetical economy there are 11 pairs of hour-wage decisions to choose from similar to Table 3. Starting with Economy C, in which participants are told that everyone around them works 40 hours and earn US$ 362.3 (2,500 BOB), participants are asked to choose whether they want to work the same and earn the same, work less and earn less, or work more and earn more. After participants made their decision, they are asked to choose their preferred work-income combination for economies 2D and 2E. In Economy 2D others around works 50 hours and earn US$ 452.9 and in Economy 2E others around works 60 hours and earn US$ 543.5. Note that there is no change in the budget constraint facing the participants, so if individual i is not positional-concerned, he will not change his preferred choice. However, participants who sacrifice leisure for additional income are considered followers; and those who increase leisure time at the expense of income are considered deviants. Finally, they choose their preferred work-income combination for economies 2A and 2B in which other individuals place more value on leisure time and therefore work less. A participant with no positional concerns would not change labor choices from one hypothetical economy to another.

Table 4: Survey Instrument - Part II: A Positional Concerns Problem

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	1250.0	20	1250.0	20	1250.0	20	1250.0	20	1250.0
25	1562.5	25	1562.5	25	1562.5	25	1562.5	25	1562.5
30	1875.0	30	1875.0	30	1875.0	30	1875.0	30	1875.0
35	2187.5	35	2187.5	35	2187.5	35	2187.5	35	2187.5
40	2500.0	40	2500.0	40	2500.0	40	2500.0	40	2500.0
45	2812.5	45	2812.5	45	2812.5	45	2812.5	45	2812.5
50	3125.0	50	3125.0	50	3125.0	50	3125.0	50	3125.0
55	3437.5	55	3437.5	55	3437.5	55	3437.5	55	3437.5
60	3750.0	60	3750.0	60	3750.0	60	3750.0	60	3750.0
65	4065.5	65	4065.5	65	4065.5	65	4065.5	65	4065.5

4 Results

This section presents the main research questions and hypotheses followed by results from the behavioral experiment. First, I explore how, in the absence of destructive actions, positional concerns affect effort levels. I then analyze the direct and indirect consequences of destructive behavior on welfare. Table 5 summarizes the research questions, hypotheses, and the activities from the experimental game that are used to test each hypothesis.

Table 5: Overview of the Main Research Questions and Hypotheses

Question	Hypothesis	Activities
Q1: Do interpersonal comparisons affect effort levels?	**H1**: Individuals invest greater effort as a result of comparing themselves with others.	1 and 2
	H2: Individuals concerned with their relative position exert more effort than others with no relative concerns.	1, 2, and 4
Q2: Does destructive behavior reduce welfare?	**H3**: Individuals with lower output take destructive actions against those who are relatively better off.	3
	H4: Highly ranked individuals reduce effort level due to fear of retaliation from lower ranked individuals.	1, 2, and 3
	H5: Individuals concerned with their relative position take more destructive actions than those who are not.	3 and 4
Q3: Is destructive behavior symmetric in direction?	**H6**: Individual reduces the outcome of the "richest" individual more than the second richest and so on. In other works, individuals are rank egalitarian in their burning actions.	3

4.1 Effects of Interpersonal Comparisons on Effort

In order to test if interpersonal comparisons affect effort levels, I first analyze whether individuals invest greater effort as a result of comparing themselves with others. Then, I examine if this effect varies between individuals who are concerned with their relative position and those who are not concerned.

Result 1: *When rankings were revealed to the participants, those who earned below the group mean increased their effort by 6% while those ranked above the group mean decreased their effort by 6%.*

To test hypothesis 1, I use the first two activities of the experimental game. Recall that in activity 1 participants play the effort task 3 times. After participants saw their earnings in each round and the average of the three rounds, activity 2 started by showing participants the earnings of others in their group and their ranking, which is the treatment. I use the following pre-post treatment effect estimation:

$$Y_{it} = \beta_0 + \beta_1 Rank + \beta_2 \underline{Z_i} + \beta_3 S + \epsilon_i \tag{1}$$

where Y_{it} is equal to the effort exerted by agent i in round $t = 1...4$ (i.e., activity 2 is considered round 4). It is a function of: i) *Rank* which is a dummy variable equal to 1 in round 4 in which individuals are presented with their ranking in their group, and zero otherwise, ii) a set of individual characteristics $\underline{Z_i}$, and iii) session fixed effects S and iv) clustered errors at the session level. If β_1 is positive and significant, increasing interpersonal comparisons by showing participants their ranking in their group has a positive effect on effort levels.

Since the effort task consists of separating and collecting as many beans as possible in one minute and participants are likely to get better with practice (specially if this is the first time they ever perform this task), it is important to control for possible learning effects in the effort task. There are many ways in which I can control for this learning effect. If I assume that after 3 rounds the learning effect disappears, I can compare round 3 and round 4 and allude any difference to the treatment effect. Since this assumption may be too strong, I can control for learning effects in the effort task through a regression discontinuity design imposing a functional form. In order to analyze which functional form fits the data the best, I first impose a linear function on repetition and find that it underestimates the mean in the second round and overestimates the mean in the last round. An exponential function underestimates the mean in the second round and overestimates the mean in the last rounds even more. Finally, a concave function on repetition predicts the mean earnings the best and follows with the idea that learning by repetition usually increases at a decreasing rate. Then, I use the following pre-post treatment effect estimation imposing a concave function on repetition:

$$Y_{it} = \gamma_0 + \gamma_1 Rank + \gamma_2 Ln(round) + \gamma_3 \underline{Z_i} + \gamma_4 S + \epsilon_i \tag{2}$$

Table 6 presents the results of the estimation 1 comparing round 3 and 4 and estimation 2 in which I impose a concave functional form on repetition. Specification (1) in Table 6 shows the result of the first estimation and find that β_1 is significant and positive. However, when I impose the concave functional form, I find that there is no effect on effort when individuals know their relative position and ranking in their group (i.e., γ_1 is not statistically different from zero) (estimation 2).[10]

[10]Results are robust when clustering at the individual level, and using random effects.

Table 6: Panel Regression Model (Individual Level Fixed Effects)

Y: Experimental Earnings	(1)	(2)
Rank^{+}	0.260***	-0.013
	(0.057)	(0.067)
Log of round		0.988***
		(0.077)
Constant	4.770***	3.674***
	(0.028)	(0.054)
Observations	570	1,140
R-squared	0.068	0.410
Number of id	285	285

Standard errors in parentheses clustered at the session level
*** p<0.01, ** p<0.05, * p<0.1
$^{+}$Dummy variable equal to 1 when individuals are presented with their ranking.
(1) Compares round 3 versus round 4.
(2) Imposes a concave functional form on round using all rounds 1 to 4.

However, when I analyze estimation 2 for participants only above and only below the group mean earnings, I find that participants above the mean exert less effort and participants below the mean exert more effort when they are presented with their ranking (Table 7). Experimental earnings increased by 6% for those below the group mean earnings and decreased by 6% for those above it compared to the predicted earnings without treatment.

Table 7: Summary of the Heterogenous Treatment Effects by Relative Position

Relative Position	Predicted earnings without treatment^{+}	Predicted earnings with treatment^{++}	Treatment Effect γ_1 $^{+++}$
Above the group mean	5.832	5.515	-0.317***
Below the group mean	4.270	4.555	0.285***
Rank # 1	6.440	5.956	-0.484***
Rank # 2	5.679	5.236	-0.443**
Rank # 3	5.004	5.189	0.185
Rank # 4	4.414	4.680	0.267**
Rank # 5	3.744	4.124	0.381**

*** p<0.01, ** p<0.05, * p<0.1
$^{+}$Predicted earnings as if ranking was not revealed to participants.
$^{++}$Predicted earnings when ranking is revealed to participants.
$^{+++}$The treatment effect was estimated using a panel regression model with individual level fixed effects and imposing a concave function on repetition for each group.

When I analyze estimation 2 by ranking, I find that participants ranked first and second reduced their effort exerted by 7.5% and 7.8% respectively while participants ranked third (middle) did not change their effort level when presented with their ranking. In the same logic, participants ranked last and second to last increased their effort by 6% and 10% respectively (Figure 2).

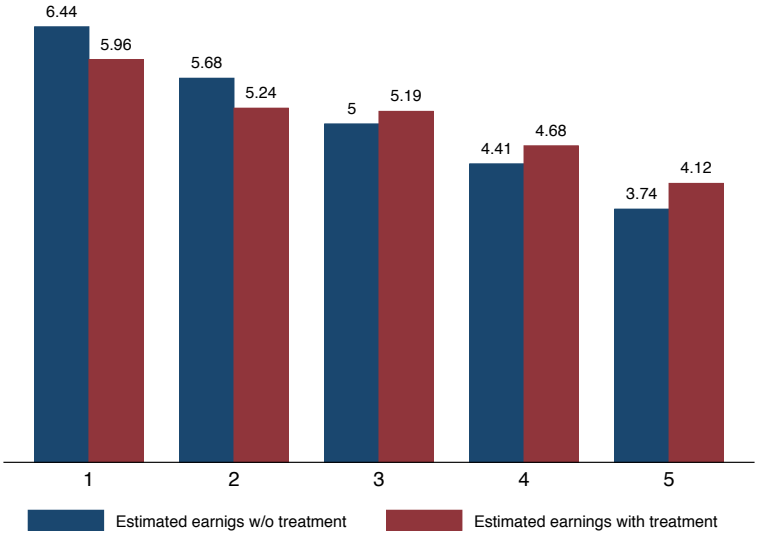

Figure 2: Earnings with and without treatment by rank. Participants highly ranked (#1 and #2) reduced their effort after they were presented with their relative earnings and ranking in their group, while participants ranked # 4 and # 5 increased their effort.

Result 2: *Participants without positional concerns did not significantly change effort once presented with their ranking and relative earnings. In contrast, positional-concerned participants changed the level of effort exerted.*

In order to measure individuals' concerns with their relative position in the group, I use activity 4. This activity replicates the survey instrument developed by Pingle and Mitchell (2002). In the base economy where participants had to choose their preferred labor-leisure combination without a reference point, participants chose to work an average of 44.5 hours. In the second part of the activity where participants choose their preferred work-income combination with different reference points, the average participant exhibited significant follower behavior that is significantly different from the base economy. The follower decided to work less in economies 2A and 2B, and more in 2D and 2E (Figure 3). These results are similar to the ones found by Pingle and Mitchell (2002).

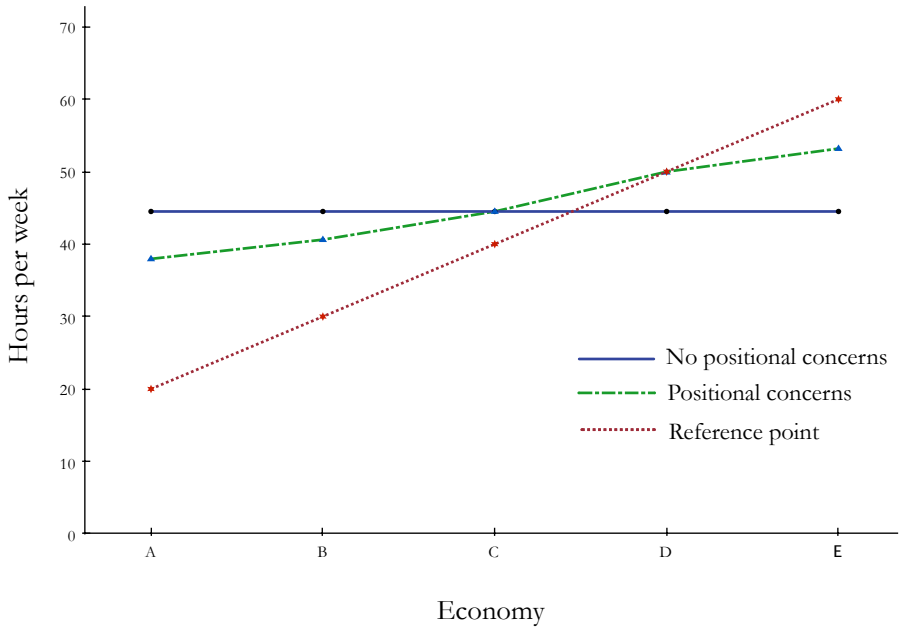

Figure 3: Positional Concerns. The average participant was considered a follower (dashed-dot line) with a significantly different behavior than the base economy (solid line) in all the scenarios. Participants chose to work more than the reference point (dotted line) in economies A, B, and C and less in economy E.

I classify individuals into two categories: 1) No positional-concerned if individuals did not change their preferred work-income combination from one hypothetical economy to another; and 2) Positional-concerned if individuals changed their preferred work-income combination from one hypothetical economy to the other. Out of all the participants, 82% are positional-concerned. Table 8 shows a summary of the heterogeneous treatment effect for participants who present positional concerns and for those who do not. I present similar results for participants above and below the group mean.[11] The treatment effect is not significant among participants without positional concerns for both below and above the group mean. On the other hand, participants that present positional concerns changed the level of effort exerted once presented with their ranking and relative earnings.

[11]Results are robust when clustering at the individual level, and using random effects.

Table 8: Summary of the Heterogenous Treatment Effects by Positional Concerns and Relative Position

Relative Position	Positional-Concerned	Treatment Effect $^{+}$
All	NO	-0.062
	YES	0.000
Above the mean	NO	-0.353
	YES	-0.309***
Below the mean	NO	0.250
	YES	0.291***

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

$^{+}$The treatment effect was estimating using a panel regression model with individual level fixed effects and imposing a concave function on repetition

4.2 Effects of Destructive Actions on Welfare

I first analyze whether individuals with lower output take destructive actions against those who are relatively better off. Then, I look at highly ranked individuals and test if they reduce effort levels due to fear of retaliation from lower ranked individuals. Finally, I test whether individuals concerned with their relative position take more destructive actions than those who are not.

Result 3: *When destructive actions are allowed, 55% of the participants are willing to pay to burn others' earnings, and 58% were victim to destructive actions, losing approximately one third of their earnings. 82% of burning decisions were against higher ranked participants.*

In order to test hypothesis 3, I use the burning decisions that people took in activity 3. Each participant took four burning decisions (one for each member of their group) for a total of 1,140 observations in this activity. Out of 1,140 decisions, 302 or 26.5% were burning decisions, with 55% of participants taking at least one destructive action against another group member. More than half of the participants were affected by the destructive actions of others and lost an average of US$ 2.1, equivalent to 34.2% of their total earnings. The overall burning rate, defined as the percentage of money an individual burns, was 5.14%. These results are smaller than the ones found in the original burning game in which the generation

of earnings is semi-random.[12]

Table 9 presents the burning behavior by ranking and position relative to the mean (above or below). More participants below the group mean took at least one burning decision than participants above the mean (statistically different from zero, $p<0.05$). Participants ranked fourth took the highest number of burning actions, spending an average of 6% of their earnings. Most burning decisions were against higher ranked participants, however, there was a considerable number of destructive actions against lower ranked participants, in particular from participants ranked first and second. Interestingly, 22.2% of participants who were in second place took money from those ranked higher, as well as those ranked lower. Figure 4 shows the distribution of earnings by ranking.

Table 9: Who Burns? Summary Statistics of Burning Behavior in the Experiment

Distribution	Burning^{+}	Amount burned^{++}	% of own earnings spent	% of participants who destroy those:			
				above	below	above & below	equal^{+++}
Above the group mean	48.9%	1.83	3.1%	30.0%	30.5%	12.1%	3.6%
Below the group mean	60.4%	2.37	5.9%	59.3%	4.1%	2.8%	0.1%
Rank # 1	41.7%	1.53	2.4%	0.0%	41.7%	0.0%	0.0%
Rank # 2	51.8%	1.76	3.1%	50.0%	24.1%	22.2%	3.7%
Rank # 3	62.5%	2.00	4.0%	59.0%	14.3%	10.7%	5.3%
Rank # 4	66.1%	2.59	6.0%	66.0%	5.3%	5.4%	1.8%
Rank # 5	52.5%	2.55	7.1%	52.0%	0.0%	0.0%	0.0%
Total	54.7%	2.13	4.7%	44.9%	17.2%	7.4%	2.1%

$^{+}$Percentage of individuals who took at least one burning decision against a group member.
$^{++}$Total amount of money that a participant took from all his group members (average).
$^{+++}$Not reported: percentage of participants who destroyed those below/above/both & equal.

[12]In the first stage of the original money burning game, each participants is randomly assigned as high or low income player. Then, players can use any amount of their initial endowment to buy a more than actuarially fair lottery with a 50% chance of winning three times the amount invested. Zizzo and Owald (2001) carried out the burning game among 116 students from Warwick University and find that 62.5% of their participants took a destructive decision and lost on average 48.7% of their earnings. Kebede and Zizzo (2015) carried the same game among 240 Ethiopian peasants and 60 students from Addis Ababa University. They find that the burning rate is about 8% and only 20% did not take a burning decision across 3 rounds.

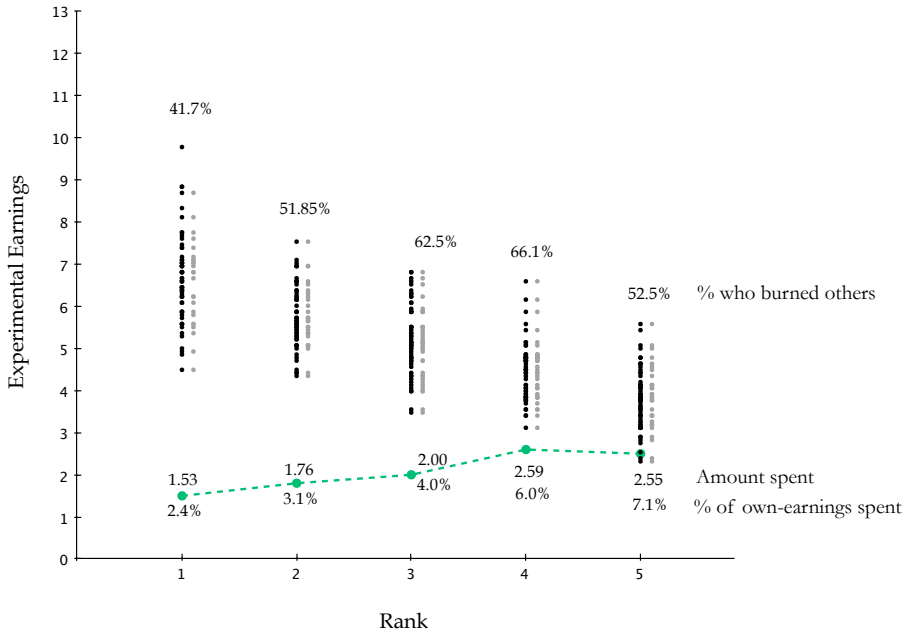

Figure 4: Who burns? The distribution of earnings by rank is represented by the black dots. The top number represents the percentage of participants in that rank who took a destructive action against somebody in their group (represented by the gray dots), the second number is equal to the total amount of money taken from others on average, and the third number is the percentage of earnings spent in burning behavior.

Result 4: *Individuals who reported being afraid of the envy of others in the game, on average, exerted less effort than individuals who did not feel threatened in the game and earned 12.6% less. The threat of destructive action reduced highest earning participants' experimental earnings by 5.8%.*

Participants that reported being afraid of the envy of others in the game,[13] on average, exerted less effort than participants who did not feel threatened in the game. This is statistically significant among participants that were ranked first in their group and had the highest earnings. High ranked participants who fear the envy of others earned, on average, US$ 0.77 less than participants who do not fear the envy of others. In other words, participants who fear the envy of others earned 12.6% less.

To test if the threat of destructive behavior affects effort, I use the following empirical estimation:

$$Y_{it} = \lambda_0 + \lambda_1 Rank + \lambda_2 Burn + \lambda_3 \underline{Z_i} + \lambda_4 S + \epsilon_i \tag{3}$$

where Y_{it} is equal to the effort exerted by agent i in round $t = 1...5$ (i.e., activity 2 is considered round 4

[13] At the end of all the activities, participants were asked how they felt when they found out that they earned more than others in the game. They could choose one or more of the following options: surprise, fear of envy, happiness, anxiety, forced to redistribute, shame, other. A quarter of the participants said that they fear the envy of others.

and activity 3 is considered round 5). It is a function of: i) *Rank* which is a dummy variable equal to 1 when individuals are presented with their relative position in their group (activity 2), and zero otherwise, ii) *Burn* which is a dummy variable equal to 1 when individuals are presented with their relative position and are allowed to burn others in their group (activity 3), iii) a set of individual characteristics $\underline{Z_i}$; and iv) session fixed effects S, and iv) clustered errors at the session level. In this estimation, λ_1 captures the effect of knowing relative position and ranking on an individuals effort. In turn, λ_2 captures the combined effect of knowing relative position and ranking when destructive behavior is possible. As such, if we assume that these two effects are additive, $\lambda_2 - \lambda_1$ is the net effect of the possibility of destructive behavior on effort levels.

Similar to the estimation strategy used in hypothesis 1, I control for possible learning effects of the effort task using the two methods previously described. I first calculate estimation 3 using results from round 3 of activity 1 and activities 2 and 3. I also impose a concave learning function on repetition using the following estimation:

$$Y_{it} = \phi_0 + \phi_1 Rank + \phi_2 Burn + \phi_3 Ln(round) + \phi_4 \underline{Z_i} + \phi_5 S + \epsilon_i \tag{4}$$

Specifications (1) in Table 10 compare round 3 of activity 1 to activity 2 and 3, and find that $\lambda_2 - \lambda_1$ is positive, significantly different from zero, and equal to 1.11. However, when I impose the functional form to control for learning effects using all the rounds of activity 1 plus activities 2 and 3, 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 (specification (2)).

Table 10: Panel Regression Model (Individual Level Fixed Effects)

Y: Experimental Earnings	(1)	(2)
Rank^{+}	0.260***	-0.013
	(0.057)	(0.067)
Burn^{++}	0.421***	-0.072
	(0.083)	(0.103)
Log of round		0.988***
		(0.077)
Constant	4.770***	3.674***
	(0.043)	(0.059)
Observations	855	1,425
R-square	0.079	0.403
Number of id	285	285

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

$^{+}$Dummy variable equal to 1 when individuals are presented with their ranking in the group.

$^{++}$Dummy variable equal to 1 when individuals are presented with their ranking in the group and destructive behavior is possible.

Analyzing estimation 4 for participants above and below group mean earnings, I find that those below the mean exert more effort under the presence of possible destructive behavior (i.e., ϕ_2 is positive and significantly different from zero). However, this is largely due to the positional concern effect (i.e., $\phi_2 - \phi_1$ is not statistically different from zero). Although participants above the group mean exert less effort when destructive actions are possible, this is also mostly due to the positional concern effect (Table 11). Only participants who ranked first in their group showed reduction in earnings explained by both positional concerns and the possibility of destructive behavior. The threat of destructive action reduced highest earning participants' effort by 5.8%.

Table 11: Summary of the Heterogenous Treatment Effects by Relative Position

Relative Position	Predicted earnings without treatment	ϕ_1	ϕ_2 [+]	$\phi_2 - \phi_1$ [++]
Above the group mean	5.31	-0.317***	-0.403***	-0.086
Below the group mean	4.78	0.285**	0.251**	-0.034
Rank #1	6.44	-0.484***	-0.828***	-0.344**
Rank #2	5.68	-0.443**	-0.361*	0.082
Rank #3	5.00	0.185	0.260	0.075
Rank #4	4.41	0.267**	0.124	-0.143
Rank #5	3.74	0.381**	0.426***	0.046

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

[+]The treatment effect was estimated using a panel regression model with individual level fixed effects and imposing a concave function on repetition for each groups.

[++]I run a linear combination test to check if $\phi_2 - \phi_1 \neq 0$.

Result 5: *Individuals with positional concerns who are ranked below and above group means showed more destructive actions than individuals who are not concerned with ranking.*

Table 12 shows destructive behavior by their position relative to the mean. Participants take more destructive actions against group members when they are positional-concerned than when they are not (57.4% compared to 42%) and this difference is significant at the 5% level. Among participants ranked below group means, participants with positional concerns showed more destructive actions than participants that were not concerned, but this difference is not significantly different from zero. Conversely, participants above the group mean that are positional-concerned had significantly more destructive actions than participants who are not positional-concerned.

Table 12: Destructive behavior and positional concerns

Relative Position	Positional-Concerned	Burning [+]	Difference[++]	Burning Rate [+++]
All	NO	42.0%	0.154**	4.351
	YES	57.4%		5.309
Above the Mean	NO	29.6%	0.239**	2.250
	YES	53.1%		4.490
Below the Mean	NO	56.5%	-0.046	6.817
	YES	61.2%		6.080

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

[+]Percentage of individuals who burned at least once.

[++]Two-sample t-test to determine if the means are equal.

[+++]Percentage of earnings destroyed when destructive action occurred.

4.3 Asymmetry in the Direction of Destructive Behavior

Result 6: *Of all the participants who ranked first, 98.3% were victims of destructive actions and the total amount of money taken from this rank is statistically different from the amount of money taken from participants ranked second and so on, demonstrating the participants' rank egalitarian behavior.*

Table 13 presents the burning rates by ranking. Most participants (98.3%) who are ranked first were victims to destructive actions, losing on average 38.4% of their total earnings (equivalent to US$2.53). The total amount of money taken from participants ranked first is statistically different from the amount of money taken from participants ranked second and so on, with the exception of those ranked 4 and 5, demonstrating the participants' rank egalitarian behavior. In addition, Figure 5 supports the rank egalitarian behavior hypothesis by depicting those who suffered a destructive action, represented by the grey dots, which decreases in density from left to right.

Table 13: Who Suffers? Summary statistics of burning behavior in the experiment

Relative Position	Probability of being burned	Difference^{+}	Amount lost^{++}	% of income burned
Above the group mean	82.3%	0.482***	2.29	37.3%
Below the group mean	34.0%		1.12	26.9%
Rank # 1	98.3%	0.187***	2.53	38.4%
Rank # 2	79.6%	0.314***	2.08	36.7%
Rank # 3	48.2%	0.089	1.61	30.5%
Rank # 4	39.3%	0.155*	0.97	22.9%
Rank # 5	23.7%		1.15	33.5%
Total	57.9%	1.94	34.2%	

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

$^{+}$Two-sample t-test to determine if the means are equal.

$^{++}$Total amount of money that an individual lost due to destructive behavior (average).

Participants ranked first directed 47.6% of their burning activity against participants ranked second, and only 7.1% against participants ranked last. Participants in the bottom burned mostly participants ranked first and second (41.1% and 31.5%). Although there is no difference in the percentage burned by ranking, participants tend to direct their destructive actions against highly ranked participants (Table 14).

Table 14: Who Burns Who? by Ranking

	Who is Rank #x burning?				
	Rank # 1	Rank # 2	Rank # 3	Rank # 4	Rank # 5
Rank # 1	0	57.1%	50.0%	47.2%	41.1%
Rank # 2	47.6%	0	30.3%	31.9%	31.5%
Rank # 3	21.4%	26.5%	0	15.3%	16.4%
Rank # 4	23.8%	8.2%	10.6%	0	11.0%
Rank # 5	7.1%	8.2%	9.1%	5.6%	0

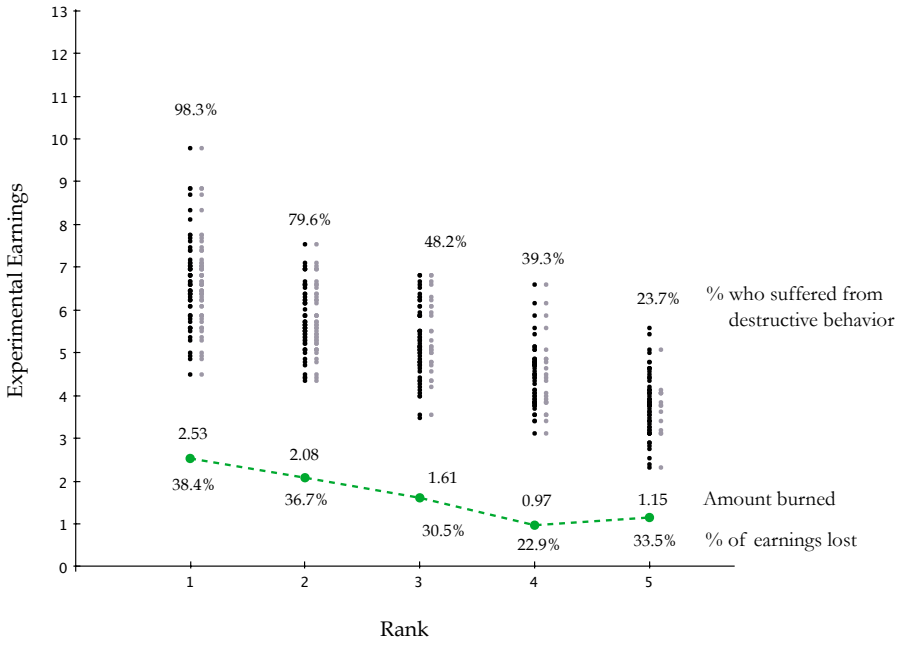

Figure 5: Who suffers? The distribution of earnings by rank is represented by the black dots. The top number represents the percentage of participants in that rank who suffered from the destructive actions of others in their group (represented by the gray dots), the second number is equal to the total amount of money that was taken away by others, and the third number is the percentage of earnings lost due to burning behavior.

4.4 Classification of Participants by Behavioral Type

Using information of individual's reaction to interpersonal comparisons in the form of changes in effort and the decision to forgo some of their own-consumption in order to burn other's in the group, I can classify those individuals concerned with their relative position in one of the categories described in Table 1 in section 2. Table 15 presents the frequency distribution of behavioral types. When individuals were below others, about 50% presented an envious behavior. Surprisingly, a quarter of the participants reduced their effort and did not destroy others above, which according to our model will be classified as those who enjoy being below others. When individuals were above others, 40% are status seekers and 41% present a guilt behavior.

Table 15: Frequency Distribution of Behavioral Types

Direction of comparison	Effort of agent i after comparisons	Destructive Action of i on j	Behavioral type of i	Proportion
$C_i < C_j$	Higher	YES	Envy	21.3%
		NO	Catch up	26.4%
	Same or lower	YES	Envy	26.8%
		NO	Underachiever	25.5%
$C_i > C_j$	Higher	YES	Malicious	7.7%
		NO	Status Seeking	40.0%
	Same or lower	YES	Fear of Envy	10.6%
		NO	Guilt	41.7%

5 Conclusions

Interpersonal comparisons with those who are relatively better off can spur individuals to increase effort or investment to "catch-up", or to "pull-down" others through harmful actions. Destructive action –such as pulling down more successful individuals within a group– can offset the positive aspects of belonging to a close-knit community and limit the effectiveness of anti-poverty initiatives and perpetuate poverty due to its direct and indirect effects on effort. In this paper, I empirically examine how interpersonal comparisons, along with the prevalence of destructive behavior, influence effort levels. I designed a unique experimental game that builds on the two-stage money burning game of Zizzo and Owald (2001) with one key modification. In the first stage, I introduce a simple effort task in which earnings depend on the number of beans participants separate from a container of beans and rice. I introduce this effort task to measure the effect of interpersonal comparisons on effort and test whether destructive behavior indirectly affects effort.

I run the experimental game among 285 dairy farmers in the Bolivian highlands and find that when participants are presented with their ranking in the group, those in the bottom half of the group earnings distribution increased individual effort whereas those above the group mean decreased their effort. When I allow for destructive actions in the experimental game, this effect is lower for those below the group mean and higher for those above. Results suggest that in addition to having a direct effect on effort were

55% burned others and about a third of earnings were destroyed, destructive behavior due to interpersonal comparisons has also an indirect effect. The threat of destructive action reduced highest earning participants' experimental earnings by 5.8%.

Destructive action can 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. Moreover, destructive behavior can also offset the positive aspects of belonging to a close-knit community and limit the effectiveness of development initiatives targeting such social groups. Specially those close-knit social groups such as workplaces, communities, and cooperatives characterized by close interactions among individuals, homogeneity in activities, and heterogeneous and observable outcomes. Therefore, although being part of a close-knit social group is often associated with cooperation, trust, and reciprocity amongst group members it is important to pay attention to the dark side of these social interactions and their impact on social and economic outcomes.

Destructive behavior in close-knit communities can limit the effectiveness of anti-poverty initiatives and perpetuate poverty, especially if they only target a portion of the group. For example, Cameron and Shah (2012) show that the mistargeting of a cash transfer program in close knit communities is associated with increases in crime and declines in social capital within communities. As many interventions only target people based on some socio-economic characteristics in many developing countries, this could create welfare externalities, which could in turn hamper their success. Similarly, when analyzing the effectiveness of a program through randomization techniques, it is important to consider possible negative effects especially if the level of randomization is at the individual level.

Additionally, since the experimental games were carried out among dairy cooperative members, the results shed light onto efficiency and productivity implications of interpersonal comparisons and destructive behavior in relevant populations. Since *Delizia* is interested in increasing the percentage of milk fat from 3.5% to 4%, they need to consider the possible implications of incentives in close-knit communities where individuals are concerned with relative earnings and present different behavioral types when designing contracts and reward incentives. For instance, providing incentives for higher effort by showing employees their relative productivity and ranking every month can increase effort for some, but can have the opposite effect on others as found by Ashraf (2014). Furthermore, if the possibility of destructive behavior exists, reward programs no longer have negative effects only on those who decide to reduce their effort, but also have negative effects on others who suffer from destructive actions or/and reduce their effort so they don't provoke the envy from others.

I find that a little more than half of the participants in the study decrease their effort when presented with their ranking in their group. These results, together with the fact that 55% of the participants decided to destroy those above and/or below, reward programs that incentivize individual success may have detrimental effects on overall productivity and may have harmful consequences for a working environment if they are not correctly tailored to the context of the group. *Delizia* may benefit from creating a reward program that pays extra for milk fat to the entire community, with a clever incentive to avoid free-riders, such as introducing competition between groups (Cárdenas and Mantilla [2015]).

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