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

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Abstract

Accumulating research has shown that individuals' welfare is affected not only by the absolute amount of resources at their command but also, by their relative position vis-a-vis others. Individuals' concerns about their relative positions may influence individuals' choices and affect their behavior. For example, upward interpersonal comparisons may spur individuals to reduce consumption gaps by increasing effort or investment to "catch-up" or by "pulling-down" others through destructive actions.

"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 the other's output is destroyed and one's resources are consumed. In addition, the threat of destructive actions may lead to lower levels of effort and investment.

In order to empirically examine how interpersonal comparisons affect effort levels, the prevalence of destructive actions, and how the threat of destructive actions affect effort levels; I designed a set of behavioral games that build on the two-stage "money burning" game. I introduce 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.

The experimental games were carried out in Bolivia among 285 dairy farmers. I find that when destructive actions are not allowed, positional concerns matter for the bottom half of the earnings distribution. When rankings were revealed to the participants, those below the group mean earnings increased their effort by 7.5%. When I allow for destructive actions, 55% of people are willing to forego higher own-consumption in order to "destroy" others' output; 58% were victims to destructive action and lost on average 34% of their earnings. There is an asymmetry in direction of destruction, 98.3% of the highest earners suffered some destruction, while only 23.7% of the lowest earners were victims to destruction actions. Finally, the threat of destructive actions reduced highest earners' effort by 6%.

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

1 Introduction

A growing body of research in sociology, anthropology, social psychology, and economics has shown that individuals' beliefs and desires are affected by social preferences and these preferences affect decision making and behavior having important consequences for economic development[1]. For instance, many studies have found 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 [9] [22] [20] [1] [36] [6] [27] [29] [31].

When people constantly compare themselves with others in their environment and care about their relative position, interpersonal comparisons may influence individuals' choices and can affect their behavior. Interpersonal comparisons can affect decisions regarding where to work and live [13] [18] [33] [19]; affect contributions, cooperation, and risk taking behavior [9] [25] [16]. In addition, interpersonal comparisons can spur individuals to reduce consumption gaps by increasing effort or investment to "catch-up" [15] [32] [17] or by "pulling-down" others through a set of actions that are destructive to those around, even if these actions are costly to themselves [34] [15] [20]. Consequently, linking reactions to upward social comparisons may help explain the considerable variability in how people have been shown to react to such comparisons. In this paper I focus on how interpersonal comparisons affect effort levels, the prevalence of destructive behavior, and how the threat of destructive actions affect effort levels.

Destructive behavior may have serious implications for a number of areas of interests to economists, such as bargaining, human welfare, firm structure, consumption and taxation, economic growth [39], inter-industry wage differentials, and contract designs. For instance, 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.

Moreover, destructive behavior may have both direct and indirect detrimental effects on productivity and efficiency. On one hand, destructive behavior directly reduces welfare and 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. For instance, evidence shows that people abstain from behavior that would provoke the "envy" of others [8] and as a result, individuals may be discouraged from engaging in riskier actions, such as adopting new technologies, or entrepreneurship. Moreover, individuals may be afraid to engage in productive economic activity for fear of social backlash and retaliation [15]. While some literature acknowledges the possible effects of destructive actions on effort and investment [8] [20] [24], I am unaware of any theoretical and empirical evidence on the direct and indirect effects of destructive behavior. This paper begins to understand this gap in the literature. I first explore the degree to which interpersonal comparisons directly affects effort levels. I then analyze the direct and indirect consequences of destructive actions, defined as destroying others' output, on welfare.

The behavioral experiment that I designed builds on the two-stage "money burning" game of Zizzo and Owald (2001)[2] . I replace the random generation of participants' earnings with a simple effort

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[1]Many studies have established that individuals act in a pro-social behavior manner, such as helping, reciprocating [11], donating [2], and cooperating [9] motivated by empathy [7], fairness [12] [11], or altruism [28]; and others have found that sometimes individuals also act in an antisocial behavior manner, such as punishing [5] and retaliating [10] motivated by envy [23] [3] [8] [20] [24], revenge, unfairness [26] [30], or resentment.

[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 [40].

task in the first stage. Specifically, earnings depend on the number of beans individuals separate from a container full of beans and rice.

The next section introduces the conceptual framework and explains how interpersonal comparisons can lead to changes in effort levels and how they can result in destructive actions. The experimental protocol is described in section 3 and Section 4 presents the results from the experiment that was carried out among dairy farmers in Bolivia. Finally, section 5 concludes.

2 Conceptual Framework

In this section I present the conceptual framework behind the experimental design. I introduce a simple utility function to illustrate how interpersonal comparisons may affect individuals' welfare, influence effort levels, and potentially lead to destructive behavior.

2.1 A Simple Interpersonal Utility Function

A straightforward means of incorporating interpersonal comparisons is the following utility function where agent i's utility depends both on his own consumption and his relative consumption with respect to agent j, which is a slightly modified version of Fehr and Schmidt (1999) with the addition of effort.

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

$$U^i(C_i, e_i, C_j; \theta_i^a, \theta_i^b, \alpha) = C_i(e_i) - \theta_i^a \max[C_j(e_j) - C_i(e_i), 0] - \theta_i^b \max[C_i(e_i) - C_j(e_j), 0] - \alpha e_i^2 \quad (1)$$

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 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.

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 level is lower than agent j's consumption and agent i is concerned with his relative position, there is disutility generated from agent j's superiority[3]. In other words, agent j's increase in consumption has a negative externality on agent i because it lowers his relative consumption [22] [3]. Then, if individual i derives disutility from being behind agent j when making interpersonal comparisons, 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 [37] [23] [32] [14]. Either way, agent i is reducing his disadvantageous difference and therefore increases his utility.

On the other hand, similar to Fehr and Schmidt (1999), agent i's utility may not only be affected by a consumption disadvantage (i.e., $C_i < C_j$), but also from a consumption advantage (i.e., $C_i > C_j$). Then, if agent i's consumption is higher than agent j's consumption, agent i may suffer disutility generated from his superiority (the "guilt" case) or agent i may gain utility if he enjoys being ahead of others (the "status seeking" case [13]). In the first case, agent i may exert less effort to reduce this difference and he will never take a destructive action. In the latter case, agent i can take two actions:

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[3]The disutility generated from the positive difference between C_j and C_i can be thought as inequity aversion/ inequality aversion [12], or envy [24] [35].

1) he can exert more effort to be even further away from agent j, or 2) he can destroy agent j's earnings to increase this advantageous difference.

3   Behavioral Experiment

The experimental game was designed to empirically examine how interpersonal comparisons affect effort levels, the prevalence of destructive actions, and how the threat of destructive behavior affects effort levels. The experimental design builds on the two-stage "money burning" game of Zizzo and Oswald (2001) [40] 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 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.

3.1   Experimental Design

Each experimental session consisted in 10 activities followed by a questionnaire, lasted approximately 3.5 hours, where 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. In this paper I only focus on activities 1, 2 and 3, which were always in the same order, and activity 10 which was always at the end.

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 3 to increase the number of independent observations to improve statistical power. Activity 10 was played individually.

In the first three activities individuals performed an effort task to earn money: 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 50 cts. of boliviano (about US$ 0.072) per gram of beans collected. In activity 3 individuals played the burning stage: after all individuals were 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.[4].

While everyone made money-burning choices, only one of them got implemented and determined final winnings for each individual i. Hence, even though the amounts of all the players of each group that want to burn are recorded, only the choices of 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 an individual choice task. It also prevented below-zero outcomes [38].

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 drew from the bag represented the outcome of the activity

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[4]Zizzo 2003 found that money burning was mostly inelastic when $p = 0.02$ to $p = 0.25$ [38]. For sake of comparison I chose $p = 0.1$ similar to the cost of burning money in Kebede and Zizzo 2015 [21]

that he received as final payment. Individuals only saw their final outcome of the activity that was randomly selected at the end of all activities (i.e., they only knew if somebody in their group decided to "burn money" in that particular activity). The name of the randomly chosen "dictator" was kept anonymous at all times. This was done in order to ensure anonymity and avoid possible retaliation within the game and outside the game.

3.1.1 Description of Activities

Activity 1. Effort: At the beginning of the activity, individuals were randomly assigned in groups of 5. In this activity they played the effort task 3 times. At the end of this activity each participant received a paper with their earnings in each round and their final earnings in this activity which was equal to the average of their earnings in each round.

Activity 2. Positional Concerns and Effort Levels: At the beginning of the activity, individuals were presented with the average earnings of others in their group in activity 1 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 the members of the group were kept anonymous. After seeing the earnings 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 the 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 10: Positional Concerns This activity aims to get a parameter of positional concerns. I replicated the survey instrument constructed by Pingle and Mitchell (2002) where subjects were asked a series of hypothetical labor market situations. 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 3) 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.

3.1.2 The questionnaire

The questionnaire was divided into 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 participants' perceptions and reactions of the experimental session.

- **Hypothetical Questions:** 4 questions meant to capture another proxy of how concerned participants are relative to others.

3.2   Experimental Site

The game sessions were carried out with members of dairy cooperatives in the Altiplano of Bolivia. I chose 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 efficiency and productivity implications of destructive behavior in populations where these concerns are highly relevant. For instance, couple of years ago, these dairy farmers protested against a bonus reward program designed to increase the percentage of milk fat with the argument that everybody should receive the same price and that they didn't like this "price discrimination", resulting in the abolition of this award program and the incentive to produce better quality of milk. Both *Delizia* (an ice-cream factory that works with approximately 2,700 dairy farmers in Bolivia) that implemented the bonus mechanism and dairy farmers that invested in a series of feeding procedures to increase percentage of milk fat were negatively affected by the actions of others.

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 amounting to one and a half day's wage in the Bolivian context.

Figure 1: 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 10 cows at maximum.

These communities are located in the altiplano close to Lake Titicaca (Figure 1). 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 Aymaras speak spanish as a second language (especially younger generations).

In general, communities in the altiplano sell their milk to *Delizia* or Pil[5]. However, dairy farmers are only members of one of the two dairy factories. The four communities are:

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

- **Cucuta:** located near El Alto, about 22Km from the center of La Paz. *Delizia* only works with female diary farmers in this town and works with 54 diary farmers 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 in 4 different groups.

- **Patamanta:** a small town located 35Km from the center of La Paz, *Delizia* works with about 69 dairy farmers.

3.3 Descriptive Statistics

The participants

Participants were in average 40 years old, 60.7% are female, three-fourths are married and indigenous Aymara. In average, they have 8.3 years of education, 91.2% of them know how to read and write. The last time they were in school was on average 20 years ago when they were 17 years old. Participants consider themselves somewhat competitive, giving themselves a score of 7 out of 10 where 10 is extremely competitive (Table 14).

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 14).

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 15). Their average self-reported monthly earnings is about 269USD, which is slightly less than their average monthly payments over the past 12 months reported by *Delizia*, which is about 283.5USD (Figure 2).

The experiment

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 occasion, and would help only 30% of the people in the session (Table 17). I use a factor analysis to construct a social capital index using these variables to control for social tightness of the group.

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[5]Pil is the biggest dairy factory in Bolivia.
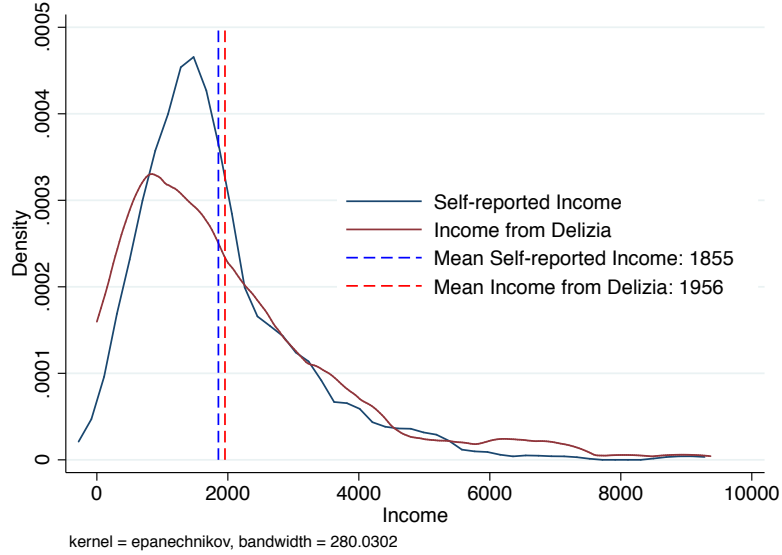
Figure 2: Distribution of self reported earnings and average income over the last 12 months reported by *Delizia*.

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. Then, I analyze the direct and indirect consequences of destructive behavior on welfare. On one hand, destructive behavior can reduce welfare directly by destroying someone's output, and indirectly if the threat of destructive actions induces ex-ante behavioral responses in the form of lowers effort levels. Table 1 summarizes the research questions, hypotheses, and the activities from the experimental game that are used to test each hypothesis.

These hypotheses will be tested using a variation of the following empirical estimation:

$$Y_{it} = \beta_0 + \beta_1 \underline{X_i} + \beta_2 \underline{Z_i} + \beta_3 EXP + \epsilon_i \tag{2}$$

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.

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Table 1: Overview

Question	Hypothesis	Activities
Q1: Do positional concerns 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 10
Q2: Does destructive behavior reduce welfare?	**H3**: Individuals with lower output take a destructive action against the most advanced ones.	3
	H4: Highly ranked individuals reduce their effort out of fear of retaliation from the more disadvantaged ones.	1, 2, and 3
	H5: Individuals concerned with their relative position take more destructive actions than others not concerned with their relative position	3 and 10
Q3: Is destructive behavior symmetric in direction?	**H6**: Individual reduces the outcome of the "richest" individual more than the second richest and so on (i.e., rank egalitarian).	3

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 (from high to low) and their ranking.

In order to test this hypothesis, Y_{it} in equation 2 is equal to the effort level agent i exerts in each round t (i.e., activity 2 is considered round 4) and $\underline{X_i}$ is equal to T which is a dummy equal to 1 for activity 2 and zero otherwise. If β_1 is positive and significant, positional concerns affect effort levels positively.

Table 2 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. In the next specifications I control for learning effects in the effort task by doing 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.e., $\underline{X_i} = \beta_{11}T + \beta_{12}Log(Round_t)$). 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[6].

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

Table 2: Panel regression model (individual level random effects)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
			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 3: Heterogenous treatment effects

	(5)	(6)
Above the Mean	-2.188***	-2.188***
	(0.690)	(0.699)
Below the Mean	1.966***	2.046***
	(0.691)	(0.712)
Rank #1	-3.341***	-3.341***
	(0.959)	(0.972)
Rank #3	-3.054***	-3.054***
	(1.132)	(1.147)
Rank #3	1.278	1.414
	(1.019)	(1.026)
Rank #4	1.840***	1.894***
	(0.696)	(0.726)
Rank #5	2.626***	2.626***
	(0.984)	(0.998)
Observations	1,140	1,132
Number of id	285	283
Session FE	NO	YES
Socio-economic Characteristics	NO	YES

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

However, when I analyze the last two specifications for people above and below the group mean earnings, 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 3). When, I analyze the same set of regressions by ranking, I find that people ranked first reduce their effort exerted more than people ranked second. People ranked third (middle) do not change their effort level when presented with their ranking. Finally, people ranked last increase their effort more than people ranked second to last.

H2: Individuals concerned with their relative position exert more effort than others with no relative concerns.

In order to measure if individuals are concerned with their relative position with respect to others in their group, I use the survey instrument developed by Pingle and Mitchell (2002) described in section 3.1.1. In this activity, participants had to choose their preferred work-income combination under different scenarios that vary in the preferred combination of others around them in three different parts. I will focus on the second part of the survey instrument. Individuals were asked to complete Table 4 which contains 5 hypothetical economies.

Table 4: 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

In each column there are 11 pairs of hour-wage decisions that they can pick from. Column C is the baseline 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 2,500 bolivianos and they 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 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. 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 statistical difference in economy D from the reference point.

Table 5: Positional concerns: Heterogenous treatment effects

		(5)	(6)
All	Positional Concerned	-0.023 (0.423)	0.009 (0.431)
	No Positional Concerned	-0.402 (1.207)	-0.402 (1.224)
Above the mean	Positional Concerned	-2.012*** (0.603)	-2.012*** (0.611)
	No Positional Concerned	-2.931 (2.096)	-2.931 (2.125)
Below the mean	Positional Concerned	1.851*** (0.675)	1.945*** (0.695)
	No Positional Concerned	2.566 (1.712)	2.566 (1.735)
Observations		1,140	1,132
Number of id		285	283
Session FE		NO	YES
Socio-economic Characteristics	NO	YES	

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

Table 5 shows the heterogenous treatment effect for people who present any type of positional concerns and for the ones that do not present positional concerns. I present similar results for people above and below the group mean and by ranking [7]. The treatment effect is not significant among participants without positional concerns for both below and above the group mean. On the other hand, people that present any type of positional concern change their effort level exerted once they are presented with their ranking and relative earnings.

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:

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

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. More than half of the people were affected by the destructive behavior of others and lost in average a total of 34.2% of their earnings. The overall burning rate, which is defined as the percentage of money an individual burns, is equal to 5.14%.

Table 6: Who burns?

Rank	Takes a DA	Total amount taken	% of earnings spent	% above	% below	% both	% 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 6 presents the burning behavior by ranking, above/below the mean and total. More people below the group mean took at least one burning decision than people above the mean (statistically different from zero, $p<0.05$). People ranked fourth 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 perform 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.

In order to test this hypotheses, Y_{it} in equation 2 is equal to the effort level agent i exerts in each round t (i.e., activity 2 is considered round 4 and activity 3 is considered round 5) and $\underline{X_i}$ is equal to $T2$ which is a dummy equal to 1 for activity 2 and zero otherwise and $T3$ which is also a dummy equal to 1 for activity 3 and zero otherwise (i.e., $\underline{X_i} = \beta_{11}T2 + \beta_{12}T3$). In this estimation, β_{11} is capturing the effect on agent i's effort of knowing his relative position and ranking in his group. β_{12} 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 $\beta_{12} - \beta_{11}$.

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

Variable	(1)	(2)	(3)	(4)	(5)	(6)
			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

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. 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) in Table 7 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. 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 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., $\beta_{12} - \beta_{11}$ is not statistically different from zero). Similarly, people that are above the 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 8, specifications (5) and (6)). When people are ranked first, they reduce their effort exerted and this reduction seems to be explained by both, positional concers and the presence of possible destructive actions.

When I analyze the heterogenous treatment effect by behavioral type for people above and below the group mean I find that people below the mean who are concerned with their relative position exert more effort under the presence of possible destructive behavior (i.e., $T3$ is positive and significantly

Table 8: Heterogenous treatment effects

	T2	T3	T3 -T2
Above the Mean	-2.188***	-2.779***	-0.591
	(0.697)	(0.884)	(0.566)
Below the Mean	2.046***	1.783**	-0.263
	(0.710)	(0.844)	(0.798)
Rank #1	-3.341***	-5.712***	-2.371**
	(0.970)	(1.068)	(0.936)
Rank #3	-3.054***	-2.489*	0.565
	(1.145)	(1.287)	(0.883)
Rank #3	1.414	1.917*	0.503
	(1.024)	(1.089)	(0.868)
Rank #4	1.894***	0.844	-1.050
	(0.724)	(1.204)	(1.055)
Rank #5	2.626***	2.941***	0.315
	(0.996)	(0.973)	(0.653)
Observations	1,415	1,415	1,415
Number of id	283	283	283
Session FE	YES	YES	YES
Socio-economic Characteristics	YES	YES	YES

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

different from zero) however, this seems to be explained mostly by the positional concern effect (i.e., $\beta_{12} - \beta_{11}$ is not statistically different from zero). Similarly, people that are above the group mean and are positional concerned exert less effort under the presence of possible destructive actions, but it also seems to be explained mostly by a positional concern effect (Table 9).

Table 9: Positional concerns: Heterogenous treatment effects

		T2	T3	T3 -T2
All	Positional Concerned	0.009 (0.430)	-0.413 (0.743)	0.422 (0.512)
	No Positional Concerned	-0.402 (1.221)	-0.846 (1.106)	0.444 (0.752)
Above the mean	Positional Concerned	-2.012*** (0.610)	-2.972*** (0.936)	0.960 (0.698)
	No Positional Concerned	-2.931 (2.120)	-1.963 (1.637)	-0.968 (1.111)
Below the mean	Positional Concerned	1.945*** (0.693)	2.038** (0.877)	-0.093 (0.769)
	No Positional Concerned	2.566 (1.731)	0.466 (1.561)	2.100 (1.472)
Observations		1,415	1,415	1,415
Number of id		285	283	283
Session FE		YES	YES	YES
Socio-economic Characteristics		YES	YES	YES

Standard errors in parentheses clustered at the session level

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

H5: Individuals concerned with their relative position take more destructive actions than others not concerned with their relative position.

Table 10 presents the destructive behavior by their behavioral type when they are above and below the group mean. More people take destructive actions against somebody in their group when they are positional concerned than when they are not positional concerned (57.4% compared to 42%) and this difference is significant at the 5% level. Among the individuals that were below the 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 group mean that are positional concerned took more destructive behavior than people that are not positional concerned (53.1% compared to 29.6%).

Table 10: Destructive behavior and positional concerns

	Behavioral Type	(1) Take	(2) % Take
All	Positional Concern	0.574**	5.309
	No Positional Concern	0.420	4.351
Below the Mean	Positional Concern	0.615	6.128
	No positional Concern	0.565	6.817
Above the Mean	Positional Concern	0.531**	4.424**
	No positional Concern	0.296	2.250

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

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 11, 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 group mean and when agent i is above the group mean (specifications (3) and (4) respectively).

Results show that higher academic achievement increases the likelihood of engaging in destructive behavior[8]. Interestingly, the stronger the tights among the participants, the higher the likelihood of destructive behavior.

Table 11: 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

[8]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.

Q4: Is destructive behavior symmetric in direction?

In order to test if destructive behavior is symmetric in direction, I test three hypotheses:

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

Table 12 presents the burning rates by ranking. Almost everybody (98.3%) that collected the most amount of beans (rank # 1) suffered some destruction and lost in average 38.4% of their earnings equivalent to 17.48 bolivianos in total. The total amount of money taken from people ranked first 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.

Table 12: 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%

Moreover, Table 13 shows the burning behavior by ranking. People ranked first do not burn anybody in the same ranking (i.e., they cannot burn themselves), 47.6% of their burning activity is against people ranked fourth burning 20.9% of their earnings. People in the bottom burn mostly people ranked first and second (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.

Table 13: 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

5 Conclusions and Discussion

In this paper I examine how interpersonal comparisons affect effort levels, the prevalence of destructive actions, and how the threat of destructive actions affect effort levels. I designed a set of behavioral games that build on the two-stage "money burning" game. I introduce 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. I run the experimental game on 285 dairy farmers in the Bolivian highlands and find that when destructive actions are not allowed, positional concerns matter for the bottom half of the earnings distribution. When rankings were revealed to the participants, those below the group mean earnings increased their effort by 7.5%.

When I allow for destructive actions, 55% of people are willing to forego higher own-consumption in order to "destroy" others' output; 58% were victims to destructive action and lost on average 34% of their earnings. There is an asymmetry in direction of destruction, 98.3% of the highest earners suffered some destruction, while only 23.7% of the lowest earners had some destruction. Finally, the threat of destructive actions reduced the highest earners' effort by 6%.

Since the experimental games were carried out among dairy cooperative members, the results may give us a deeper understanding of efficiency and productivity implications of interpersonal comparisons and destructive behavior in populations where these concerns are important. Relevant contexts are workplaces, communities, and cooperatives characterized by close interactions among individuals, homogeneity in activities, and heterogeneous and observable outcomes. On one had, since positional concerns affect effort levels, a factory, for example, could provide incentives for higher effort by showing employees their relative productivity and ranking every month. They can award the employee of the month, or they can pay a bonus to the top 10 employees, etc. However, if the possibility of destructive behavior exists, all these reward programs may have opposite effects on overall productivity and may have detrimental consequences for the factory working environment.

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6 Appendix

6.1 Tables

Table 14: 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 15: 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 16: 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 17: 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