



Destructive actions and productivity: Experimental evidence on interpersonal comparisons among dairy farmers in Bolivia

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ABSTRACT

Interpersonal comparisons can lead individuals to improve their relative position by "catching up" to their peers through increased effort, or by "pulling down" others through harmful actions. To empirically examine how interpersonal comparisons affect productivity, this study utilizes a lab-in-the-field experiment that was conducted in Bolivia among 285 dairy farmers. The experiment consists of a baseline effort-elicitation and three treatments. The first treatment reveals to participants their baseline rankings; the second treatment allows participants to pay to destroy the output of others in their group; and the third treatment introduces inequity by placing a randomly-chosen group member into a more favorable production setting. This paper reports three main findings. First, in the absence of destructive actions, low-productivity participants increase their productivity whereas high-productivity participants decrease their productivity. Second, more than half of the participants are willing to give up their earnings to destroy the output of their peers. Finally, those who were placed into a more favorable production setting have a 29% higher probability of being destroyed by somebody in their group, showing evidence of destructive actions being motivated by a sense of fairness.

1. Introduction

Individuals are motivated by self-interest as well as by interpersonal comparisons—their performance and material payoffs compared to their peers (Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999; Luttmer, 2005; Solnick and Hemenway, 1998, 2005; Varian, 1974; Veblen and Banta, 2009). The relative nature of interpersonal comparisons can create forces acting in opposite directions. Interpersonal comparisons can help increase productivity by encouraging individuals to exert more effort in order to "catch-up" with more successful individuals.¹ At the same time, interpersonal comparisons can lower productivity by leading individuals to "pull down" others in order to improve their relative position. While many studies have investigated the "catch-up" effects, the "pull down" effects of interpersonal comparisons on productivity remain understudied in the empirical literature.² Furthermore, to the best of my knowledge, no studies have examined both the "catch-up" and "pull down" effects on productivity within the same empirical setting.

This paper uses an innovative experimental game conducted among members of dairy cooperatives in a developing economy context to

examine the behavioral implications of interpersonal comparisons on productivity. Specifically, this paper first explores the "catch-up" effects by looking at the degree to which payoff-based interpersonal comparisons directly affect productivity. Then, it analyzes whether interpersonal comparisons lead individuals to "pull down" others through destructive actions. The consequences of destructive actions are analyzed across three dimensions: i) by examining the total amount of output foregone; ii) by looking at the distribution of this loss across participants, and iii) by measuring the change in productivity when destructive actions are introduced into the game. Finally, this paper studies how productivity and the intensity of destructive actions vary when inequity is introduced by placing a randomly-chosen member of each group into a more favorable production setting.

The experiment comprises four activities that are played sequentially: a baseline activity and three treatments. The baseline activity introduces an effort task in which participants' output depends on the number of beans individuals separate from a container of dry beans and rice. In the baseline, participants play the effort task in three consecutive rounds. Next, in treatment one, participants are first presented with their baseline

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¹ Several studies show that the "catch-up" effect, also referred to as "keeping-up-with-the Joneses" effect, leads to increased effort (Blanes-i-Vidal and Nossol 2011; Bowles and Park 2005; Goltsman and Mukherjee 2011; Neumark and Postlewaite 1998).

² Zizzo and Oswald (2001) and Abbink and Sadrieh (2009) are notable exceptions. Zizzo and Oswald (2001) found that about two-thirds of participants in a lab setting spent their own money destroying other participants' output. Abbink and Sadrieh (2009), in a similar lab setting, found that the "pull down" effect leads to output being destroyed almost 40 percent of the time.

rankings within the group and the output of other group members, and they are asked to perform the effort task again. This treatment measures for any additional effort that individuals may exert due to the “catch-up” effect. Treatment two comprises two stages. In the first stage, individuals repeat the effort task once. Then, in the second stage, individuals are initially presented with their first-stage rankings within the group and the output of other group members. Then, they are allowed to pay to destroy the output of other group members. This treatment, in essence, is a modified version of the “money burning” game of Zizzo and Oswald (2001). The main difference is that while in Zizzo and Oswald (2001) output is generated by luck and risk behavior, in this experiment, output is generated through effort.³ Finally, treatment three introduces inequity by placing a randomly-chosen member of each group into a more favorable production setting, which consists of a higher proportion of dry beans in the container.

This experimental design is innovative in three distinct ways. First, it allows studying both the “catch-up” and “pull down” effects of interpersonal comparisons on productivity within the same experimental setting. Second, the experiment allows studying the “pull down” effects of interpersonal comparisons on productivity in the presence of inequity. Third, the experiment is conducted among members of dairy cooperatives in a developing economy context where small, stable communities make interpersonal comparisons prevalent. In addition, the within treatment design allows comparing participants’ reactions when information about rankings is provided and when destructive actions are possible.

The findings can be summarized as follows. First, when presented with their ranking within the group and the output of other group members, participants conform to the group mean: on average, low-productivity participants increase their productivity by 6.7% whereas high-productivity participants reduce their productivity by 5.4%. Second, more than half of the participants (54.7%) are willing to forego part of their production to destroy others’ output. Third, nearly all the highest earners (98.3%) are victims of destructive actions, losing on average 38.4% of their total output. Fourth, highest earners reduce their productivity by 5.1% as an ex-ante behavioral response to avoid the destruction of others. Finally, participants in a more favorable production setting, on average, increase their productivity by 42%. Although the total amount of destruction does not increase when a randomly-chosen group member is placed into a more favorable production setting, those who receive the more favorable production setting have a 29% higher probability of being destroyed, and they lose half of their new extra output.

The rest of the paper is organized as follows. Section 2 describes the experimental site, the participants, and the experimental design. Section 3 first explores the direct effects of interpersonal comparisons on productivity, and then the indirect effects of interpersonal comparisons on productivity through destructive actions. Section 4 examines the impact of introducing inequity on productivity and the intensity of destruction. Section 5 offers a few concluding remarks.

2. Behavioral experiment

2.1. Experimental site and participants

The experimental sessions were carried out in 2015 among members of dairy cooperatives in four Aymara communities located in the surroundings of the city of El Alto in Bolivia.⁴ Dairy farmers have an

³ The “money burning” game in Zizzo and Oswald (2001) has two stages: (i) the betting stage, which introduces random variation in participants’ earnings through betting, and (ii) the burning stage, which allows participants to pay to reduce others’ output.

⁴ The pool of participants also includes factory workers of Delizia—the largest ice cream company in Bolivia. Due to low participation rate among factory workers the experimental sessions were conducted among 266 dairy farmers and only 19 factory workers. The results presented in sections 3 and 4 hold when I exclude the factory workers.

average of 7 cows of which half produced milk actively at the time of the interview. Their average self-reported daily milk production is 11 kilos per cow, and their average monthly milk revenue, of US\$ 271, is about a third higher than the minimum wage in Bolivia.⁵ The average age of participants is 40 years old; there are more female participants (60.7%), and on average participants have eight years of schooling (Appendix A, Table A1).

Carrying out this experiment among members of a dairy cooperative can shed light on the effects of interpersonal comparisons on productivity in a setting where these concerns have been shown to have significant impact for two reasons. First, dairy farmers in these provinces usually deliver their milk production twice daily to the same milk tank belonging to Delizia (an ice cream factory in Bolivia). The milk is weighed, and the quantity is recorded in front of everybody. As such, the small dairy producers are able to see output differences and compare themselves with each other on a regular basis. Second, there is strong evidence of sabotage related to egalitarian principles among dairy farmers in these Aymara communities. For instance, a few years before, dairy farmers protested a bonus reward program offered by Delizia designed to increase the percentage of milk fat. Farmers opposed this form of price differentiation because it undermined equality among cooperative members. The protest resulted in the elimination of the reward program and consequently the incentive to produce milk of higher quality.

2.2. Experimental design

Each experimental session comprises the same ten activities that are structured to test a range of hypotheses and to control for order effects. This paper uses the first four activities that are always played at the beginning of the session and in the same order.⁶ The specific order and the within treatment design allows comparing participants’ reaction when information about rankings is provided and when destructive actions are possible.⁷

Individuals are informed at the beginning of the game that it consists of 10 activities, but they do not know in advance what they have to do in each activity—they are only given instructions right before the start of each activity. After completing all activities, participants fill out a questionnaire to collect information on participants’ social-economic characteristics, their familiarity with other participants in their session, and their feelings provoked by the game. To incentivize participants to maximize their performance in every single activity, after they complete all the activities and fill out the questionnaire, each participant randomly picks one numbered chip from a black bag that corresponds to one of the ten activities. This randomly selected activity determines their monetary earnings based on their output performance.

In total, 285 individuals participate in 21 sessions of 10 activities each. Each session has either 10 or 15 participants and lasts on average three and a half hours. At the beginning of each session, individuals are randomly assigned to a group containing a total of five members. Although the participants in a session are able to see each other, the identity of the other four group members is kept secret, and their group composition remains unknown at all times.⁸ Group composition is

⁵ At the time of the interview, the price per kilo of milk in Bolivia was set by the government at BOB 3 or US\$ 0.43 at the official exchange rate, and the minimum monthly wage was US\$ 206. Exchange rate: 6.90 BOB per 1 USD.

⁶ The other activities were designed to parameterize a theoretical model on destructive actions, and are part of another study.

⁷ To control for possible learning effects that may arise when using a within-subject design, the study imposes a concave function on repetition, as explained in section 3.1.

⁸ Some dairy farmers did not understand Spanish and could not participate in the game. To ensure groups contained always a total of five members, the dairy farmers that could not participate were replaced by “ghosts” in the game, whose output was equal to the group mean. The inclusion of “ghosts” allows to rank the final output of the group members in descending order from 1 to 5. “Ghost”

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