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Is increasing inequality harmful? Experimental evidence

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Is Increasing Inequality Harmful? Experimental Evidence

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Abstract

Is Increasing Inequality Harmful? Experimental Evidence

by Dietmar Fehr*

Increasing inequality is commonly associated with social unrest and conflict between social classes. This paper reports the results of a laboratory experiment to study the implications of rising inequality on the tendency to burn others' income. The experiment considers an environment where higher earnings are typically associated with higher effort and varies how fair and transparent this relationship is. The findings indicate that increasing inequality does not per se lead to more money burning. Rather, it depends on whether the increase in inequality can be unequivocally attributed to exerted effort. If subjects can tweak the income-generating process in their favor, money burning is substantially higher. Low-income subjects are more likely to burn others' income and most of the money burning is aimed at subjects with higher incomes.

Keywords: inequality, money burning, fairness

JEL classification: C72, C92

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1 Introduction

There has been a substantial increase in economic inequality in recent years, which has brought inequality into the focus of public and economic debates (e.g., Piketty, 2014). A major concern is that too much inequality may trigger social unrest and conflicts between social classes. While inequality is to some extent inevitable, it is not only the degree of inequality that raises concerns. Many people contest the fairness of the current income and wealth distribution and express a preference for a more equal society (Norton and Ariely, 2011). Indeed, individuals' views about the fairness of the composition of inequality affects how they respond to increasing inequality (e.g., Konow, 2000; Cappelen et al., 2007, 2013). However, little is known about the implications of individuals' fairness views of increasing inequality on their tendency to engage in behavior that is harmful to others.

Harmful (or antisocial) behavior is frequently observed. People become victims of random violence, for example, when protests turn into riots or more generally in conflict situations (e.g., Abbink and Herrmann, 2011; Abbink and Sadrieh, 2009). Sometimes people find pleasure in destroying or damaging the property of others. Indeed, there are many accounts, mostly from former socialist countries, that document hostility and attacks toward more successful people. Such behavior is often attributed to an effort to restore equality among peers (see, e.g., Mui, 1995, and reference therein for more detailed examples).[1] While there are many possible motives for engaging in antisocial behavior, it seems appealing to assume a relationship between inequality and behavior that harms others without apparent benefits for the transgressor.[2] Yet causal empirical evidence is scarce, as it is difficult to isolate the different motives for antisocial behavior and to study changes in the degree and composition of inequality.

To study the relationship of inequality and antisocial behavior, I turn to evidence from a laboratory experiment. This allows me to focus the analysis on harmful behavior that is possibly aimed at reducing inequality, i.e., burning the income of others, and to investigate how such behavior depends on the fairness of increasing inequality. The experiment consists of a production phase and a taking phase. In the production phase participants complete a real-effort task, for

[1] A related and widely documented phenomenon is antisocial punishment, that is, the sanctioning of people who behave prosocially (e.g., Gächter, Herrmann and Thöni, 2005; Anderson and Putterman, 2006; Herrmann, Thöni and Gächter, 2008).

[2] Inequality has traditionally been associated with the occurrence of aggression and violent conflicts in academic research (e.g., Gurr, 1970; Sen, 1973) as well as in anecdotal evidence and numerous media reports. However, the empirical literature is not conclusive and there is an ongoing debate about the determinants of violent conflict (see e.g., Blattman and Miguel, 2010). Similarly, inequality has often been linked to social class conflicts as exemplified by the recent Occupy movements.

which they receive a piece rate wage. To vary inequality, in some treatments the best-performing participant in a group of four receives, in addition to the piece rate, a bonus payment. That is, the bonus payment stretches out the income distribution by increasing the income gap between the top performer and the other participants in a group. In the taking phase, participants receive information on the performance and earnings of all other group members. They can then burn some of the income of each other group member. Burning money involves no material gain for the burner and direct retaliation for expected income reductions is not possible because only the decision of one group member is actually implemented.

The experiment considers an environment where higher earnings are associated with higher effort and where external factors, such as luck, play little role. While many fairness ideals prevail in theory and society, prominent normative theories of justice assume that inequalities arising from effort and merit should not be eliminated (e.g., Roemer, 1998; Konow, 2003). In fact, these theories received ample support from laboratory experiments, suggesting that a majority of people do not eliminate inequalities that are due to merit or effort or for which people can be held responsible (Konow, 2000; Cappelen et al., 2007, 2013; Mollerstrom, Reme and Sørensen, 2015). This fairness view, however, critically hinges on the transparency of the income-generating process. If it is not possible to judge whether greater rewards are due to greater effort and whether the process is fair, the acceptance of inequality may change and with it the inclination to engage in harmful behavior. In particular, this may be the case when people can engage in activities that can have private but no social benefits, such as corruption, rent seeking, doping or fraud, and are thus condemned by society. To investigate this possibility, I consider a treatment variation with a bonus payment where all subjects have the possibility to artificially inflate their performance, which is not observable to other group members.[3] This treatment, therefore, explicitly distorts the fairness of the income distribution by allowing subjects to tweak the income-generating process in their favor.

The main finding of this study is that the extent of antisocial behavior crucially depends on the composition of inequality. In line with previous findings, antisocial behavior is present even in situations with little inequality. However, while an increase in inequality that can be unambiguously attributed to exerted effort does not lead to significantly more money burning, this is not the case when the increase in inequality can be distorted by subjects' attempts to manip-

[3] Activities that only have private benefits are arguably often available. For example, in professional work environments it is often not perfectly observable how much effort others put into a project and whether someone makes use of unfair labor practices to inflate their performance in order advance in the hierarchy.

ulate their performance. More specifically, if the link between increasing inequality and exerted effort is not transparent and observed effort may be the result of unethical behavior, the share of money burning attempts is almost twice as high as in a situation in which inequality is small and the income-generating process is transparent. The results further suggest that most of the money burning attempts are aimed at equalizing incomes when inequality is high. First, top-ranked subjects are significantly less likely to reduce others' income than other subjects. Second, the likelihood of the decision to reduce others' income and the suggested amount of reduction is increasing in others' income, but only in the two bonus treatments. Moreover, there is some evidence that negative emotion, i.e., anger, is positively associated with money burning when higher inequality can be the result of unethical behavior but not in the two other treatments.

This paper is related to a strand of the literature that investigates the relationship between inequality and antisocial behavior (e.g., Zizzo and Oswald, 2001; Zizzo, 2003; Abbink, Masclet and Mirza, 2011; Grossman and Komai, 2013). In these experiments, subjects can typically generate wealth by investing in risky projects and the prospects of the investment opportunities depend on the random assignment of advantaged or disadvantaged player roles at the beginning. They illustrate that burning others' income is a widespread phenomenon and that initially advantaged subjects (the rich) are more likely to be the target of antisocial behavior than initially disadvantaged subjects suggesting that money burning is an effort to equalize final earnings.[4] In contrast to the present study, merit or effort do not play a role in these studies as the positions in the income distribution depend on luck. Moreover, these studies do not consider the impact of increasing inequality and its fairness on antisocial behavior. Thus, the findings of this study contribute to a more complete understanding of antisocial behavior and, in particular, highlights that it is not an increase in inequality per se that induces more antisocial behavior, but it is the composition of inequality that matters.

The findings of this study also complement the recent literature on inequality acceptance (e.g., Konow, 2000; Cappelen et al., 2007, 2013; Akbaş, Ariely and Yuksel, 2014). These studies are mostly interested in which fairness ideals emerge in response to differences in how inequality is generated. As such, they focus on how stakeholders or spectators redistribute total wealth, which is typically generated through risky or risk-free investments.[5] Importantly, although redistribu-

[4] A few papers demonstrate the prevalence of antisocial behavior even in situations where the motive of inequality reduction is missing and money burning may occur out of pure pleasure (e.g., Abbink and Sadrieh, 2009; Abbink and Herrmann, 2011; Prediger, Vollan and Herrmann, 2014).

[5] A related stream of literature is interested in the demand for redistribution and its link to fairness perceptions (e.g., Krawczyk, 2010; Erkal, Gangadharan and Nikiforakis, 2011; Durante, Putterman and van der Weele, 2014; Rey-Biel,

tion can lead to a reduction of income for some subjects, it is always to the benefit of another subject and is thus a simplistic way to mimic a progressive tax system. In contrast, the present study deals with antisocial behavior where subjects do not themselves benefit from reducing others' income. Thereby it focuses on environments where the increase in income inequality is fair and transparent, i.e., inequality can be attributed to work effort, and where it is intransparent because subjects have the hidden possibility to inflate their effort.

More generally, this study contributes to a small but emerging experimental literature showing that increasing levels of inequality can have negative ramifications on individual well-being, decision making, and ethical behavior. In a rare field study, Card et al. (2012) randomly informed a subset of employees of the University of California about the existence of a database listing the salaries of state employees and thereby provided illuminating field evidence that pay inequality leads to lower job satisfaction and a higher likelihood of job search activities for low-wage workers. Most evidence comes from lab experiments as the identification of relative comparisons in the field is a daunting task. These laboratory studies document, for example, that subjects at the lower end of the income distribution take unwise risk (Kuziemko et al., 2014), that subjects cheat more when they are aware that others earn more (Gill, Prowse and Vlassopoulos, 2013; John, Loewenstein and Rick, 2014) and that subjects with higher earnings do not give more to a charitable cause than subjects with lower earnings (Tonin and Vlassopoulos, 2013).[6] In all these studies the distribution of income is randomly assigned and there is no variation in inequality. The findings of this study extend this literature by studying the prevalence of antisocial behavior in more complex situations where higher income is linked with higher performance or a combination of higher performance and unfair behavior.

2 Experimental Setup

The experiment is divided into three parts. It starts with a real-effort task to determine subjects' initial income and after subjects get feedback on their own and relative performance in the real-effort task they can engage in antisocial behavior. The instructions contain all relevant details of these three parts, i.e., there is no uncertainty in the beginning about the nature of future tasks.

At the beginning, subjects are randomly matched into groups of four and then perform a

Sheremeta and Uler, 2015).

[6] In a recent study, Charness, Masclet and Villeval (2013) show that unethical behavior, in the form of either reducing others' performance (sabotage) or inflating own performance, is even prevalent in settings where the relative standing of subjects is determined by symbolic rewards.

real-effort task to determine their income in the first part. In the real-effort task subjects have to encode words for 20 minutes (see Erkal, Gangadharan and Nikiforakis, 2011). For this purpose, subjects receive an encryption table that assigns a unique number to each letter in the alphabet in a random order. Subjects then have to encrypt words by substituting the letters with the corresponding numbers from the encryption table. The sequence of words is predetermined and is the same for all subjects. This task does not require particular skills and therefore the performance should mainly depend on exerted effort. All subjects earn a base wage of 5 Euro and piece rate of 7 cents for each correctly encoded word. Depending on the treatment, the best-performing subject in a group gets a bonus of 8 Euro as outlined below.

After finishing the real-effort task subjects receive feedback (second part). First, subjects get feedback on their own performance (i.e., their number of encrypted words) and their income. After that they learn their relative performance in their group. That is, subjects receive an overview of the number of encrypted words, the income and bonus payment (if any) of all group members ranked from top to bottom. Before and after they get feedback on their relative performance and income within their group, subjects have to indicate their satisfaction with their performance on a seven-point scale. Notice that subjects receive relative feedback in all treatments.

The third part is the taking phase. Subjects have to decide for each of the other three group members how much of their income they want to destroy. They can burn up to half of the income of a group member, i.e., it is not possible to reduce the income of others to zero. Burning money is wasteful and involves no benefits for the burner. The decision to burn others' income costs 50 cents (independent of the amount burned and how many incomes they reduce). To reduce strategic issues, for example, fear of retaliation, only the decision of one randomly selected group member is implemented. After the decision to burn others' incomes, subjects indicate how much they believe the other group members will reduce their own income and the income of the other three group members on average. For each correct assessment they receive 50 cents. Finally, subjects state their emotions on a seven-point scale using the same types of emotions as Bosman and Van Winden (2002).[7] Although, I am mainly interested in anger, happiness, and surprise (see also Bolle, Tan and Zizzo, 2014), I include all types of emotions as filler questions and so as to avoid leading subjects in a specific emotional direction.

The experiment consists of three treatments that differ only with respect to the determi-

[7]The types of emotions include irritation, anger, contempt, envy, jealousy, sadness, joy, happiness, shame, fear, and surprise.

nation of earnings in the real-effort task. In treatment *No Bonus* a subject's income consists of the base wage and the piece rate for each correctly encrypted word and there is no bonus payment. While I expect, considerable performance differences, the modest piece rate of seven cents for each correctly encoded word ensures that the resulting income inequality is not too large. Moreover, since income is earned and greater rewards can be typically associated with greater effort, I expect no money burning in this treatment. In treatment *Bonus* there is bonus of 8 Euro for the best-performing subject in each group in addition to the base wage and piece rate. The bonus leads to a substantial increase in inequality in groups because it increases the earnings gap between a first-ranked subject and the other three group members. While the higher inequality may induce some money burning, I expect no significant increase in money burning in *Bonus* because inequalities arise due to exerted effort and external factors do not play a role. Finally, in treatment *Bonus & Cheating* the best-performing subject in a group gets a bonus of 8 Euro as in *Bonus*. The only difference is that in addition each subject can artificially increase their performance before they learn their relative performance. More specifically, if they opt to manipulate their performance, they have to pay 1.5 Euro for a 75 percent chance of increasing their performance by $x = \{11, 12, 13, 14, 15\}$ words (all equally likely). Notice that the cost is higher than the maximum gain of 1.05 Euro. Subjects do not learn whether others in their group manipulated their score, they only receive information on total performance of other group members. They also indicate their belief about how many others in their group chose to inflate their performance. Note that the possibility to manipulate the number of correctly encoded work has only a negligible impact on inequality and thus will be about the same in *Bonus & Cheating* and *Bonus*. However, the manipulation option implies that earnings cannot be conclusively attributed to exerted effort of group members in *Bonus & Cheating*. Because this introduces unfairness into income-generating process, I expect a significant increase in money burning in *Bonus & Cheating*.

I ran the experiment at the WZB-TU Berlin laboratory at TU Berlin using z-Tree (Fischbacher, 2007). In total, I recruited 204 students from a database where students from all universities in Berlin can register for participation in economic experiments at the TU Berlin (ORSEE, Greiner, 2015). Table 1 shows the details of the three treatments. A session typically lasted less than an hour and students earned on average 13 Euro (min 5 Euro and max 23.5 Euro).

Table 1: Treatments

Treatment	#Sessions	#Groups	#Subjects	Payoff	Bonus	Score
No Bonus	3	16	64	piece rate	no	not manipulable
Bonus	3	17	68	piece rate	yes	not manipulable
Bonus & Cheating	3	18	72	piece rate	yes	manipulable

Table 2: Summary statistics: Real-effort task

Treatment				Ranking			
				first	second	third	fourth
	# words encoded	min	max	# words encoded			
No Bonus	89.8	65	120	103.7	93.9	85.3	76.2
	(14.6)			(11.1)	(13.6)	(9.3)	(7.9)
Bonus	94.6	63	142	113.6	100.1	88.7	75.9
	(17.1)			(12.6)	(8.3)	(8.9)	(9.4)
Bonus & Cheating	93.0	53	155	112.2	99.7	86.2	73.9
	(18.6)			(16.7)	(10.2)	(13.1)	(12.0)

Notes: Average # of encoded words and ranking within treatments are based on pure effort, i.e., before the decision to inflate the score in *Bonus & Cheating*. Standard deviation in parentheses.

3 Results

Table 2 provides an overview of the performance of subjects, i.e., the average number of encrypted words in the three treatments. As expected, the introduction of a top-performer bonus led to a significant increase in the number of encrypted words in the two bonus treatments (*Bonus* and *Bonus & Cheating*). In *No Bonus* subjects encoded 89.8 words, on average, whereas the bonus increased the number of encoded words to 94.6 in *Bonus* and 93.0 in *Bonus & Cheating*. The performance increase in the two bonus treatments is mainly due to the higher effort of the top two performer in a group, leading to more dispersed performance within groups. For example, the average difference in encoded words between the top-ranked subject and bottom-ranked subject is about 28 in *No Bonus*, whereas it is about 38 in *Bonus* and *Bonus & Cheating*. However, the differences in encoded words across the three treatments are not statistically significant.[8]

Recall that in *Bonus & Cheating* subjects could inflate their final score by buying a lottery that provides a 75 percent chance of adding 11 to 15 encrypted words to their final score. In total,

[8]Regressing the number of encoded words on dummies for the two bonus treatments yields insignificant coefficients for *Bonus* (4.81, *std.err*. 2.95) and *Bonus & Cheating* (3.23, *std.err*. 2.91).

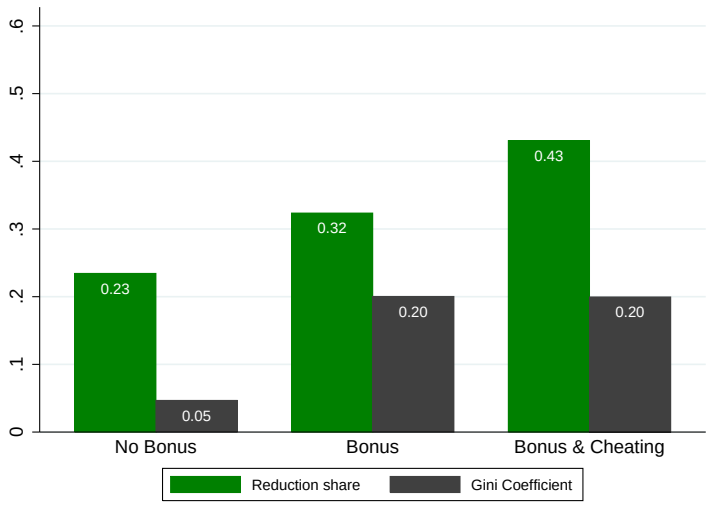

Figure 1: Share of subjects reducing other group members income

65 percent of subjects (47 out of 72) decided to artificially increase their performance by buying the lottery.[9] Not surprisingly, this decision is strongly correlated with subjects' beliefs about others' decision to buy the lottery ($\rho = 0.62$). Indeed, a large majority of these subjects (72 percent) believes that everyone else inflates the performance, whereas among honest subjects only a minor fraction (8 percent) believes that all others inflate their performance. On average, subjects believe that 73 percent of the group members buy the lottery. A more detailed look at cheating rates conditional on the performance ranking (before the cheating decision) reveals that top-ranked subjects cheat slightly less (in 50 percent of cases) than second-ranked (78 percent), third-ranked (61 percent), and fourth-ranked subjects (72 percent). Albeit, the differences are not statistically significant. The widespread cheating across ranks suggests that status concerns may play a role.[10]

Figure 1 shows the share of subjects who reduced the income of at least one other group member across the three treatments along with the average Gini coefficient. First the figure displays that the distribution of incomes is more unequal in the two treatments where the top performer in a group can earn a bonus. That is, the higher inequality within groups is a direct result of the bonus payment. Accordingly, the earnings in *No Bonus* range from 9.6 to 13.4 Euro, whereas

[9]The decision to cheat was only profitable for subjects who received the bonus (about 30 percent of subjects choosing to inflate their performance) because the cost of cheating (1.5 Euro) is higher than the expected monetary gain from the increased performance (68 Cents).

[10]Lower-ranked subjects may cheat for several reasons. They may mistakenly believe their performance is good enough to secure the bonus, they may want to increase their rank in the relative standing in the group (although the performance overview is anonymous) or they may think others below them will cheat and will overtake them in the ranking.

they range from 9.4 to 22.9 Euro in *Bonus* and from 8.9 to 24.6 Euro in *Bonus & Cheating*. Second, while subjects reduce others' income in all three treatments, it is apparent that the share of money burning decisions is higher in the two bonus treatments. In *No Bonus* 15 out of 64 subjects (23 percent) reduce the income of at least one other group member. In contrast, this share is higher in the two bonus treatments and significantly different from *No Bonus* according to a test of proportions ($p < 0.025$, one-sided).

More specifically, 22 out of 68 subjects (32 percent) reduce the income of at least another group member in *Bonus*, and 31 out of 72 subjects (43 percent) reduce others' income in *Bonus & Cheating*. Although the introduction of a bonus in *Bonus* results in significantly higher inequality and increases the share of money burning within groups, the higher share of money burning is not statistically different from the share of reductions in *No Bonus* (test of proportions, $p = 0.12$, one-sided). However, if the performance ranking in groups cannot be solely attributed to work effort, as in *Bonus & Cheating*, the share of money burning is significantly higher than in *Bonus* (test of proportion, $p = 0.096$, one-sided) and in *No Bonus* (test of proportions, $p = 0.01$, one-sided). Recall that almost two in three subjects chose to inflate their performance in *Bonus & Cheating*, but they do not differ from honest subjects in their antisocial behavior ($\chi^2_1 = 0.78$, $p = 0.38$).

The higher share of income reductions in the two bonus treatments is associated with subjects' change of their performance satisfaction after learning the relative performance feedback in their group. That is, subjects who reduce the income of others are less satisfied with their performance in response to their relative feedback than subjects who do not reduce others' income in both either *Bonus* (t-test, $t = 2.3$, $p < 0.026$) or *Bonus & Cheating* (t-test, $t = 2.2$, $p < 0.03$). This is not the case in *No Bonus* where both types of subjects react, on average, in the same way to relative feedback. Moreover, the decision to reduce others' income is also related to self-reported emotions in the two bonus treatments but never in *No Bonus*. In *Bonus* subjects who burn at least one of the other group members' income are more angry, envious, and jealous, less surprised and happy than other subjects. Albeit the differences are only significant for jealousy (t-test, $t = 2.1$, $p = 0.042$). A similar pattern emerges in *Bonus & Cheating* but with more pronounced differences. Antisocial subjects are, on average, significantly angrier (t-test, $t = 3.5$, $p < 0.01$), more jealous (t-test, $t = 2.5$, $p = 0.015$) and less surprised (t-test, $t = 2.1$, $p = 0.04$).

The bonus payments also find expression in how much subjects reduce others' income. While subjects in *No Bonus* reduce the income of the other three group members by an average of 4.7 Euro, this total amount is twice as high in *Bonus* (9.6) and in *Bonus & Cheating* (9.0). Given

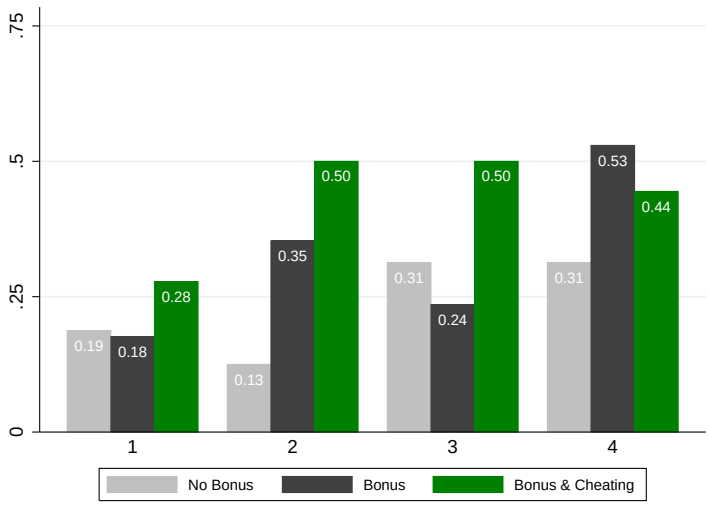

Figure 2: Share of subjects burning money by rank

that the share of subjects who burn others' income is higher in *Bonus & Cheating* than in *Bonus*, this implies that subjects in *Bonus* burn more income on average. The differences in the burned amounts are statistically significant using a Kruskal-Wallis test ($\chi^2_{(d.f.2)} = 10.7$, $p < 0.01$). A pairwise comparison reveals that the amount of money burning is significantly higher in both *Bonus* (t-test, $t = 2.6$, $p = 0.01$) and in *Bonus & Cheating* (t-test, $t = 3.4$, $p < 0.01$) than in *No Bonus*.

Figure 2 displays the share of subjects who reduced the income of at least one other group member by rank. First, it is apparent that subjects in all ranks burn the income of others to some extent. Second, the share of subjects who reduce the income of at least one group member is higher among the bottom-half performers than among the top-half performers in all treatments. Third, in the two bonus treatments subjects ranked second are more likely to reduce income than those ranked first. In fact, they burn the income of others almost twice as often (35 and 50 percent, respectively) as subjects ranked first (18 and 28 percent, respectively) and do not appear to be less likely to reduce income than subjects ranked third or fourth. Top-ranked subjects burn others' income significantly less often in *Bonus* (t-test, $t = 1.5$, $p = 0.069$, one-sided) and in *Bonus & Cheating* (t-test, $t = 1.51$, $p = 0.067$, one-sided) than lower-ranked subjects, whereas there is no significant difference in *No Bonus* (t-test, $t = 0.5$, $p = 0.31$).

Table 3 shows how much money subjects burn in total, detailed for each rank. First, the presence of a bonus increases the burned amount of money. Second, last-ranked subjects typically burn the most income on average, except in *Bonus* where subjects ranked first burn slightly more

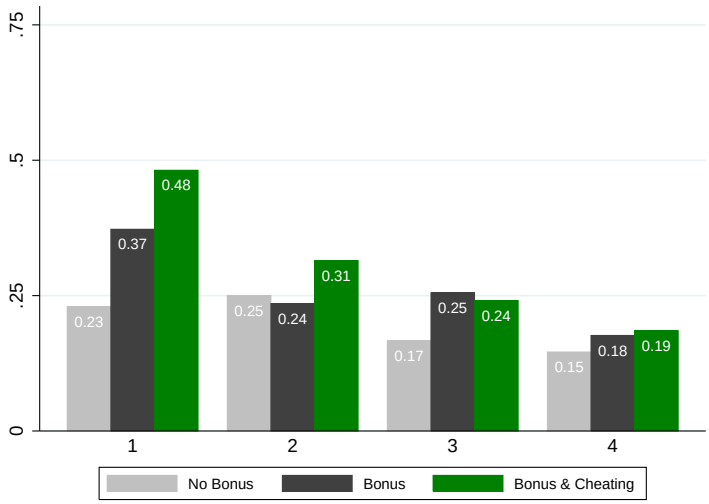

Figure 3: Share of subjects facing income reductions by rank

Table 3: Suggested average income reduction by rank

	Ranking			
Treatment	first	second	third	fourth
No Bonus	1.8	4.8	5.0	6.1
	(1.3)	(4.6)	(5.5)	(6.3)
	[3]	[2]	[5]	[5]
Bonus	13.7	7.8	3.6	12.1
	(2.5)	(3.5)	(2.7)	(4.7)
	[3]	[6]	[4]	[9]
Bonus & Cheating	8.7	7.6	8.7	10.9
	(6.0)	(5.0)	(3.5)	(7.7)
	[5]	[9]	[9]	[8]

Notes: Standard deviations in parentheses and number of observations in brackets.

money than subjects ranked last. However, there are only three observations. Third, in *Bonus & Cheating* money burning does not differ substantially across ranks, with almost the same burned amounts for the three top-ranked subjects and a somewhat higher amount for subjects ranked last. It is also noteworthy that in *No Bonus* this pattern is reversed. While subjects ranked second, third, and fourth burn roughly the same amounts, first-ranked subjects burn a less.

Who are the targets of these attempts to burn money? Figure 3 shows the share of income reductions aimed at subjects ranked first, second, third, and fourth. While all subjects face reduction attempts irrespective of their rank, it is not surprising that subjects ranked fourth are less likely to be the target of income reductions than higher ranked subjects in all treatments. Similarly, it is apparent that first-ranked subjects are most often the target of income reductions, except in *No Bonus* where subjects ranked second are slightly more often the target. Remarkably, subjects ranked first in *Bonus & Cheating* are more than twice as often the target of reductions than their counterparts in *No Bonus* (23 vs 48 percent).

Looking at money burning within treatments reveals, for example, that the share of subjects facing income reduction attempts does not differ dramatically across ranks in *No Bonus*. Though, it does seem that subjects ranked first and second are more often the target of reductions than subjects ranked third and fourth. Subjects in *Bonus*, who exerted more effort and earned a higher income, are facing more money burning. This is particularly the case for subjects ranked first, but less marked for the two middle-ranked subjects who are almost equally often the target. In contrast, the patterns are more pronounced across ranks in *Bonus & Cheating*, where the likelihood of being targeted increases monotonically with the ranking in the group. In particular, subjects ranked first are more than twice as likely the target of attempts to burn their income than subjects ranked fourth.

For more rigorous evidence, I now turn to the results of a regression analysis. Remember that each subject made three decisions, i.e., one decision to reduce the income for each of the three other group members. While the previous analysis only considered whether a subject burned others' income at least once, the regression analysis instead looks at the three individual money-burning decision separately. As subjects first decide whether to burn money at all and then choose how much, I estimate a hurdle model. This model assumes that the decision to burn money and the amount burned is governed by different stochastic processes. The first equation determines whether a subject clears the hurdle, and the second equation determines the value of the outcome

Table 4: Regression: decision to burn money and burned amount

	Pooled		No Bonus		Bonus		Bonus & Cheating	
	Probability (1)	Amount (2)	Probability (3)	Amount (4)	Probability (5)	Amount (6)	Probability (7)	Amount (8)
Expectation	0.079***	0.355***	0.103***	0.561***	0.093***	0.292	0.073***	0.015
	(0.011)	(0.092)	(0.024)	(0.109)	(0.018)	(0.200)	(0.013)	(0.228)
Burner's rank: 2nd	0.292***	0.178	0.032	0.905**	0.458***	−2.422	0.225**	−2.271
	(0.090)	(0.609)	(0.103)	(0.341)	(0.149)	(1.660)	(0.106)	(1.815)
Burner's rank: 3rd	0.339***	0.318	0.319***	2.594**	0.404**	−2.941	0.099	−2.364
	(0.100)	(0.738)	(0.115)	(0.906)	(0.178)	(1.834)	(0.149)	(1.819)
Burner's rank: 4th	0.421***	1.600**	0.378***	3.042***	0.602***	−0.215	0.145	−0.865
	(0.110)	(0.747)	(0.138)	(0.441)	(0.190)	(1.605)	(0.142)	(2.164)
Target's income	0.013***	0.450***	−0.027	0.578***	0.012***	0.428***	0.019***	0.514***
	(0.003)	(0.056)	(0.026)	(0.144)	(0.004)	(0.084)	(0.004)	(0.082)
Emotion: anger	0.028*	0.147	0.007	0.375**	0.018	0.520***	0.083***	−0.093
	(0.015)	(0.126)	(0.028)	(0.127)	(0.020)	(0.177)	(0.025)	(0.210)
Emotion: surprise	−0.018	−0.218**	−0.032**	−0.214*	0.003	−0.099	−0.056***	−0.367**
	(0.012)	(0.106)	(0.016)	(0.120)	(0.017)	(0.136)	(0.018)	(0.171)
Emotion: happy	0.027*	0.035	0.048**	0.120	0.012	−0.255	−0.007	−0.189
	(0.015)	(0.122)	(0.019)	(0.136)	(0.028)	(0.221)	(0.018)	(0.174)
Constant		−1.825		−3.537		−4.855		1.253
		(1.665)		(2.007)		(3.219)		(2.801)
Individual controls	yes	yes	yes	yes	yes	yes	yes	yes
N	612	204	192	45	204	66	216	93
(Pseudo) R^2	0.24	0.53	0.45	0.89	0.33	0.64	0.37	0.54

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

"Probability" reports the marginal effects from a probit regression and "Amount" is a truncated-linear regression. Each suggested income reduction constitutes an observation, i.e., three observation per subject, and standard errors (in parentheses) are clustered at the individual level. Expectation is the expected average reduction from others. Individual controls include sex, age and a dummy variable indicating whether a subject is enrolled in science, technology, engineering or mathematics (STEM field).

conditional on having cleared the hurdle.[11] Table 4 presents the results for the pooled data set and for each treatment separately.

Looking first at the pooled data in column 1 and 2 of Table 4, indicates that the decision to burn others' money depends on the income of the burner and the target as well as on the expectated income reduction of others. Further, subjects ranked last burn more money than subjects ranked first and the burned amount increases with the income of the target (column 2). A more detailed look at each treatment separately reveals some intersting differences in behavior.

First, Table 4 shows that expecting a reduction in own income by other group members increases the likelihood to burn others' income in all three treatments (columns 3, 5, and 7). Moreover, the expected reduction amount is positively associated with the suggested income reduction in all three treatments, albeit the coefficient is only significant in *No Bonus*. That expectations affect the likelihood of a burning decision suggests that strategic motives (e.g., retaliation) play a role even though the decision of only one group member is implemented.

In *No Bonus*, subjects ranked third and fourth are more likely to reduce others income than subjects ranked first (column 3). Moreover, subjects ranked first burn significantly less income than others (column 4). The decision to reduce the income of another group member is negatively associated with surprise and positively associated with happiness. Notice that the coefficient on anger is positive in both models, but only significantly related to the amount of money burning. Others' income does not play a role in the decision to burn, but for the suggested amount in *No Bonus*.

In contrast, the likelihood of an income reduction as well as the suggested amount of reduction increase with the income of the target in both bonus treatments. In particular, a one-point increase in the income of another group member is associated with a 1.4 percentage points higher likelihood of burning money in *Bonus* (column 5) and with a 2 percentage points higher likelihood in *Bonus & Cheating* (column 7). This suggests that the elimination of inequalities is an important motive for antisocial behavior, which is in line with previous findings (e.g., Zizzo and Oswald, 2001). While emotions play little role in the decision to burn money in *Bonus*, more anger and less surprise leads to more money burning in *Bonus & Cheating*. The regression results also reveal that subjects ranked second, third, and fourth are more likely to burn money than subjects ranked first in *Bonus*, whereas in *Bonus & Cheating* only subjects ranked second are significantly more likely

[11] Following McDowell et al. (2003) and Erkal, Gangadharan and Nikiforakis (2011) I estimate the two processes separately. First, I estimate a standard probit model for the likelihood that a subject will engage in money burning and second, I model the amount burned as a linear regression.

to burn money than subjects ranked first. The ranking has no influence on the amount of income reductions (column 6 and 8). That is, the amount burned by those ranked first is not significantly different from the amount burned by others in both bonus treatments. Note, however, that the inferences of this part of the model are based on only a limited number of observations since only few subjects opted to reduce the income of others (see also Table 3) and thus one has to be careful with the interpretation.

4 Conclusion

This paper uses a controlled laboratory experiment to investigate how increasing inequality affects harmful behavior towards others. The experiment considers an environment where higher earnings are typically associated with higher effort and varies how fair and transparent this relationship is. More specifically, an increase in inequality can either be fully attributed to exerted effort or to a combination of exerted effort and unethical behavior.

The results reveal that the extent of antisocial behavior crucially depends on how transparent the increase in inequality is. In line with previous findings (e.g., Zizzo and Oswald, 2001; Zizzo, 2003; Abbink and Sadrieh, 2009; Abbink and Herrmann, 2011), antisocial behavior is prevalent even in a situation where subjects earn their income and where inequality is low. About 23 percent of subjects reduce the income of at least one other group member in the treatment with no performance bonus (*No Bonus*). Bonus payments not only substantially increase inequality within groups, they also lead to more antisocial behavior. However, as long as increasing inequality clearly originates from exerted effort (*Bonus*) antisocial behavior is not statistically different from a situation without a bonus and low inequality as in *No Bonus*. This indicates that increasing inequality does not per se lead to more antisocial behavior. Rather, it depends on whether the increase in inequality can be unequivocally ascribed to effort, i.e., whether the increase is fair. When unethical behavior is possible as in *Bonus & Cheating*, 65 percent of subjects artificially inflate their performance and they believe that, on average, 73 percent of others will enhance their performance. As a result, almost every second subject (43 percent) in *Bonus & Cheating* engages in antisocial behavior. Importantly, antisocial behavior does not differ between subjects who do and do not artificially enhance their performance.

The results of this experiment provide evidence that inequality can indeed increase antisocial behavior. Gurr (1970), for example, argues that with rising inequality the opportunity costs

of the disadvantaged decreases, while the inclination to engage in violent redistributive demands rises. However, so far there is little empirical support for this thesis. While the lack of support may simply reflect that inequality has no bearing on antisocial behavior, it is equally likely that other reasons account for the missing evidence, such as poor availability and quality of data or inadequate inequality measures that do not sufficiently capture the motives for antisocial behavior. The findings of this study clearly refuse that there is no relationship between increasing inequality and antisocial behavior, though in a stylized setting. Moreover, the results highlight the importance of the fairness of increasing inequality for the onset antisocial behavior, something that is neglected by commonly used indicators for inequality, such as the Gini coefficient.

Relatedly, there are numerous anthropological and sociological accounts about successful people in former socialist countries or China who are victims of hostility and attacks by their less successful peers (see e.g., Smith, 1990; Mui, 1995). If success triggers antisocial behavior of others it seems possible that people avoid getting ahead in the first place.[12] The findings of this study are consistent with these accounts. The data reveal that the higher degree of money burning in *Bonus* and *Bonus & Cheating* is positively related to the income of other group members. This suggests that an important motive for this kind of destructive behavior is indeed the reduction of inequality, which can as a consequence hamper economic development.

The results may also have implications for organizational settings. Organization often implement tournament-style compensation schemes where earnings and promotions depend on relative performance comparisions (Bognanno, 2001; Bothner, Kang and Stuart, 2007; Casas-Arce and Martínez-Jerez, 2009). Yet such schemes are prone to unethical behavior such as sabotage or performance-enhancing activities. Evidence from *Bonus & Cheating* shows that a large majority engages in unethical performance-enhancing activities. But, more importantly, the results suggest that too large rewards may severly damage cooperation and interaction among co-workers. This may explain why firms sometimes prefer smaller prize spreads or rely on substantial wage compression (Lazear, 1989).

[12]For example, the research by Jakiela and Ozier (2015) illustrate that individiuals forgo profitable investments and opportunities in order to avoid the social pressure of sharing their fortune with their family or kin.

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