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FEAR THE EVIL EYE

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Fear The Evil Eye

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Abstract

This paper presents the results of an experiment where people can reduce ("burn") other subjects' money at a cost to their own, with the decisions of one of them (randomly chosen after all decisions are made) getting implemented to determine final winnings. Almost 50% of the subjects engage in money burning, eliminating some 23% of the earnings of the other subjects. The price elasticity of burning is estimated, and found to be less than one up to a lower boundary price of about 0.22. Three subjects out of four appear rank egalitarian, providing support to theories of interdependent preferences that predict that agents care about how money is divided among other agents. Relatively poor and disadvantaged agents burn at least as much as the others. Overall, money burning appears a genuine phenomenon, mirroring the institutional realities of some transition and underdeveloped economies where "the evil eye" can induce behavior closely resembling money burning, and which may hinder economic growth. Some implications for developed countries are also discussed.

JEL Classification: C91, D11
Keywords: consumer choice, money burning, envy, egalitarianism.

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1. Introduction

There is a saying among the Bemba in north Rhodesia: to find a beehive with honey is good luck, to find two beehives is very good luck, to find three beehives is witchcraft.[1] Accusations of witchcraft are linked to ostracism and retaliation in many underdeveloped societies, as they were in 12th century England, when a chronicler complained that 'excellence' was disparaged by people as being due to 'demonic aid' (Thomas 1973). Schoeck (1969, p. 60) reports that farmers in an Indian village were reluctant to adopt new kind of fertilizers or better seeds (as provided by an agricultural development program) because of the "fear of the evil eye".[2] Mui (1995) argued that envy may also be a source of self-perpetuating underdevolpment in contemporary transition economies: one case he discusses is that of a Chinese peasant in Hubei province who used the opportunities offered by the 'responsibility system' introduced in 1978 to develop a fish farming project, and got property destroyed in what looked 'envious retaliation'.

These examples, and others (e.g., Elster 1989), have two features in common. First, some agents may achieve success by engaging in some costly and risky activity, be that, say, adopting new production techniques, looking for beehives, or investing time, effort and possibly one's own safe station in life to achieve 'excellence'. Second, the other agents do not perceive this as fair, because they have less and/or because they get themselves into thinking that success is the outcome of witchcraft or the like. In an institutional setting which allows it, they may then be willing to actively damage the successful agents, and this, in turn, may stifle risk-taking and entrepreneurship. This may not necessarily be out of envy: it could be because, say, agents are inequality averse (Fehr and Schmidt 1999) or have procedurally-based fairness concerns.[3] It may not also be necessarily bad for growth, if envy is channelled in a rat race into something promoting growth, such as education as a form of human capital (Elster 1989).

This paper presents the results of an experiment where people can reduce ("burn") other subjects' money at a cost to their own. We find that almost half of them does. While everyone makes money burning choices, only those of one of them, determined randomly after everyone has made them, get implemented and determine final winnings (unlike in Zizzo and Oswald, 2001). This design enables subjects to determine how much money they want to burn as an individual choice task (if so they wish), without their burning activity needing to be conditional on their expectations about the burning activities

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[1] Thomas (1973), cited in Elster (1989, p. 261).
[2] The word for "evil eye" is *nazar lagna*, an Urdu word for the malevolent and destructive looking by another person or a demon.
[3] The *Economist* (February 16, 2002) makes a similar point in an article on the economics of envy, based on Zizzo and Oswald (2001).

of other subjects. By having subjects earn money with a betting task and with some arbitrary endowments, we can replicate the role of risk-taking and of perceived procedural unfairness in determining an income distribution. By manipulating the price of burning, we can analyze how burning changes with increases in both the absolute and the relative cost of burning. The reason why there is a relative cost to burning is that burning improves the relative position of the burner relative to the victim of burning (at least for any price less than 1), but paying the price also makes the burner worse off relative to third parties. We compute the aggregate price elasticity of burning for different price values and estimate that the demand for money burning is inelastic for a price up to at least about 0.22. We find that three burners out of four can be classified as "rank egalitarian", in the sense that they burn wealthier subjects more than or at least as much as less wealthy ones.

An institutional setting explicitly allowing for money burning is not what is normally found in developed countries. Yet, even in developed economies, arguably one reason that makes incentive schemes based on piece-rates less successful than they otherwise would is the possibility of active retaliation against those who 'step out of place' by over-producing (e.g., Jones 1984). More generally, social or financial punishments may be ways of enforcing group norms in social dilemmas (Fehr and Gachter 2000). As a third example, one can interpret breakdowns in bargaining experiments also as (emotional) ways of punishing the other player (Bosman and van Winden 2002), and there is an obvious relation between this and money burning, re-interpreted as the act of burning the bargaining surplus at a cost for oneself, not only for the bargaining party.

More generally, it is of interest to measure the extent to which subjects hold negatively interdependent preferences either globally (e.g. envy: Clark and Oswald 1998) or under some range (e.g. inequality aversion: Charness and Rabin 2000). It is well known that these can have a range of implications, for example for the usage of progressive taxation[4] (Banerjee 1990) and of counter-cyclical stabilization policy (Ljungvist and Uhlig 2000). The possibility of money burning may, therefore, be of more general interest. Further, our experimental design allows to discriminate between theories allowing for negatively interdependent preferences, insofar as it shows that money burners do care for how money is divided among other players, as some models (Charness and Rabin 2000) but not others (Bolton and Ockenfels 2000) would predict.

[4] The link is not accidental. Progressive taxation may be considered as akin to an "institutionalized" form of money burning behavior (we can think of it as money burning rather than just redistribution because of the efficiency losses that it typically implies): it may nevertheless be welfare-optimal once a role for negative interdependence in preferences is allowed.

The rest of this paper is organized as follows. Sections 2 and 3 illustrate the experimental design and results, respectively. Section 4 presents a short discussion and section 5 concludes. Appendices A and B contain experimental instructions and core experimental data, respectively.

2. Experimental Design

The experiment had two stages (plus the payment), the betting stage and the burning stage.[5] Figure 1 illustrates the structure and time flow of the experiment. The betting stage was conducive to the creation of a distribution of earnings; the burning stage allowed subjects to change this distribution of earnings by engaging in money burning. Four subjects participated to each experimental session, with the player number determined according to the alphabetical order of the last names (this was public knowledge). Standard experimental procedures (e.g., the deployment of partitions) were used to guarantee player anonymity insofar as possible. An experimental currency (the 'doblon') was used in the experiment, with each unit being worth 0.6 U.K. pence at the end of the experiment.

2.1 The Betting Stage

Practice betting. In each of the ten rounds of practice, subjects received 100 units, and had to choose how much of the 100 units to bet (i.e., a number between 0 and 100). Each subject saw only his or her score on the computer display: in this sense, betting was private. Bets were actuarially fair, and presented a chance out of three of earning three times the amount bet. Subjects also retained whatever money they did not bet.

Each computer randomly generated a number between 1 and 3. If a 1 was drawn, a subject won. If a 2 or 3 were drawn, she lost. As an example, assume that in a given round a subject bet 40 units and that the randomly generated number was 2: in this case, she lost, and was left with 60 units. Assume instead that the randomly generated number was one: in this case, she won, and would earn 40 x 3 + 60 = 180 units. However, the amounts gained in the practice stage did not count towards final actual gains.

Public betting. The subjects then played a further ten rounds. Players 1 and 2 were assigned, and could bet up to, 130 units each round; Players 3 and 4 were assigned, and could bet up to, 100 units each round; all this was common knowledge. Each round subjects could again bet in an actuarially fair bet, whose outcomes were determined exactly as in the practice. On the computer display they could see the cumulative winnings both of themselves and of the other subjects, and could not move on to the following round until everyone had taken their betting decision for the round.

2.2 The Burning Stage

[5] Of course, in the experimental instructions the labeling was neutral.

At the start of the burning stage, Players 1 and 2 were given an additional endowment of 500 units. After some practice, they could take a decision to burn the scores of any subject - including their own - by paying a price. Subjects were shown the grid displayed in Figure 2. From left to right, it showed: a) the initial scores of all players, and the endowment each player had received (e.g., 1800 for the arbitrarily advantaged subjects), in red cells; b) green cells in which they could put numbers to eliminate earnings from other players; c) a red column listing the scores after any activity of the subject (but not that of the other subjects).

Subjects could make practice by putting numbers in the various cells and clicking a button called "View". They could then see how column c would be updated with the aggregate outcome of those numbers, without making any real decision. Subjects were actively encouraged to practice for some time. They could do this by putting in combinations of numbers and clicking View, to get a grasp of what they could do, and to see how their own cash holdings would be diminished by reducing the scores of other subjects and thus paying the price. They could practice around with people's money as they liked as long as they clicked the View button, without taking any real decisions. Most subjects spent a considerable amount of time making trial allocations on their screen, including subjects who then chose not to burn. After the practice, subjects could make their actual money burning decisions, by following a step-by-step procedure which was to ensure that subjects were conscious and confident about the decisions they were making.

The price of money burning was determined according to a marginal price schedule. According to the experimental condition, each unit burnt cost 0.02, 0.05, 0.1 or 0.25 units to the burner. By paying the corresponding price, subjects could burn part or all of the scores of anyone they wanted (including themselves), though they could not reduce any score below zero. Subjects would pay this money and have their decisions implemented only if they were so chosen, randomly, by the computer: subjects did not know in advance whether they would be singled out as the one "random dictator". Since only the money burning choices of the "random dictator" actually affected subjects' winnings, subjects could choose their optimal amount of burning independently of any expectation about the burning activity of other players (this was highlighted in the verbal instructions). This is because *either* their own decision would be implemented and then the other players' would not, *or* the decision of another player would become operative, in which case theirs would not. Of course it is possible that subjects chose to burn as a probabilistic retaliation against the possible burning by other subjects, but the scope for such reciprocity concerns was clearly more indirect in our design than in one where all the money burning decisions would be implemented simultaneously, such as in Zizzo and Oswald (2001). A further advantage relative to Zizzo and Oswald (2001) was that, if all subjects' decisions were implemented simultaneously, the earnings of some subjects could go below zero out of a combination of actions by more than one player: they would then have to be truncated at zero in order to prevent subjects from suffering net losses from the experiment.

Subjects had to wait until everyone had made their decision, whether of zero or positive burning, before moving on to the payment stage.

3. Experimental Results

A total of 22 sessions ($n = 88$) were run with mean earnings of 7.48 UK pounds (1247.135 units) for about 45 minutes of work.[6] Figure 3 displays the distribution of money burning in the various experimental conditions: the overall average was 453.287 units, and mean values ranged from 865.438 in the 0.02 price condition, to 483.438, 552.7, 249.211 and 129.063 in the 0.05, 0.1, 0.25 and 0.4 conditions, respectively. Virtually all the money burning was directed against other subjects.[7] Money burning was negatively related to the price, as we would expect (Pearson $r = -0.246$, $P < 0.01$, one-tailed; Spearman $\rho = -0.195$, $P < 0.05$, one-tailed). There was a negative correlation between decision to burn and price, although one at the borderline of significance (Pearson $r = -0.122$, $P > 0.1$, one-tailed; Spearman $\rho = -0.141$, $P < 0.1$, one-tailed): 0.563 of the subjects burnt in the 0.02 and 0.05 condition, 0.400 in the 0.1 and 0.25 condition, and 0.375 in the 0.4 condition. Among burners, average burning was 985.900 units, equal to 0.231 of all the earnings of the other players,[8] or the burning of about 6 U.K. pounds (£ 5.92): Figure 4 displays the distribution of money burning among burners.

Demand elasticity of money burning. Table 1 employs the results of Tobit regression estimates of the marginal impact of price on average burning across all subjects (not just burners) to compute elasticity values for money burning demand according to one of two possible methods. Let y be the amount burnt and p the price. Then the elasticity we are interested in is defined by $\varepsilon = (dy / dp) / (y / p)$. The first method uses the Tobit estimates not only to compute (dy / dp), but also to determine y as the conditional expectation $E [y \mid y \geq 0]$. By using this method, we find that money burning is mostly inelastic, with elasticity values ranging from -0.046 for $p = 0.02$, to -0.699 for $p = 0.25$. Elasticity is

[6] Due possibly to a computer failure, a subject (subject 3 of session 14 in Appendix B) started the burning stage with exactly 0 pounds, and so could not burn even if he wanted. We remove this observation in the analysis below in relation to the burning stage (so n = 87).

[7] Mean self-burning was 6.938, 6.25, 0, 1.75 and 0 units in the 0.02, 0.05, 0.1, 0.25 and 0.4 conditions, respectively, i.e. from 0 to less than 4 U.K. pence. Appendix B reports data on all burning, including self-burning (the single largest instance of self-burning was of 100 units, in relation to subject 1 in session 1).

[8] 0.230 excluding self-burning.

equal to - 1 for p = 0.334, and becomes elastic for higher values of p, though not by much: for p = 0.4, ε = - 1.261.

The second method for computing elasticity uses Tobit estimates to compute (dy / dp) but employs sample mean burnt amounts (for p = 0.02, 0.05, 0.01, 0.25 and 0.4) as values for y. We then find that money burning is inelastic up for prices up to 0.01, and becomes elastic for a price of 0.25 and 0.4. A linear interpolation is used to fit y values for p between 0.1 and 0.25, and, by doing so, money burning demand becomes elastic for p > 0.244. Similar results are found if OLS, rather than Tobit, estimates are used (ε < - 1 for p > 0.221).

Rank egalitarianism. Wealthier subjects were burnt more than poorer subjects: if we define a variable BurnObject equal to the sum of the amounts a subject is targeted with burning in any given session,[9] there is a significant correlation between BurnObject and score (Pearson r = 0.328, P < 0.01;[10] Spearman ρ = 0.362, P < 0.01). Another way of looking at this correlation is by creating two ordinal indexes, ORank and OBurn. Let ORank = 1 for the richest among the other players, 2 for the second richest, and 3 for the poorest; let OBurn = 1 for the subject whose score a player reduces most, equal 2 for the second most reduced and 3 for the least reduced.[11] There is a positive Spearman correlation between ORank and OBurn, with ρ = 0.569 (P < 0.001): subjects that are higher in terms of wealth ranking get burnt more.

One problem with interpreting this correlation is that there may be a significant correlation between ORank and OBurn even if subjects randomly choose how to divide their optimal amount of burning, say because they do not actually care about how earnings are distributed among the other subjects. This is because no one can be burnt below a score of zero: since richer subjects have more that can be burnt, they will be burnt by a greater amount on average. In trying to assess how strong this spurious correlation is likely to be, numbers were drawn randomly from a uniform distribution, multiplied by the score of each player faced by the decision-maker, and then used to compute a fictional OBurn (call it OCarlo) based on the Monte Carlo simulation. This procedure was followed thirty times. As expected, a spurious correlation was found between score and amount being burnt: however, the average correlation was only ρ = 0.227 (min: 0.023; max: 0.403; S.E. = 0.009), a significantly smaller value than the actual correlation of 0.569 (t = 37.978, d.f. = 119, P < 0.001). Hence, while the actual

[9] When more than one subject has targeted a victim, BurnObject does not actually correspond to the amount the victim is losing out, because of the random dictator nature of the experimental design: only the decisions of a single burner are implemented.
[10] Here and below, all tests are two-tailed unless where specified otherwise.
[11] For both ORank and OReduce, in case of ties between first and second place, a value of 2 was assigned; in case of tie between second and third, a value of 3.

correlation would have probably been smaller had it not been for the spurious effect, a correlation appears genuinely to exist between rank and being targeted by burning activity.

Another way of thinking of this correlation is by checking the fraction of burners that satisfy what we might call a rank egalitarian relationship. We consider a burner as satisfying a rank egalitarian relationship if she reduces the score of the richest of the other subjects at least as much as or more than the second richest, and that of the second richest at least as much or more than that of the poorest subject. Exactly three burners out of four (thirty out of fourty) were rank egalitarian according to this definition: 0.778 of the burners (7 out of 9) were rank egalitarian for a price of 0.02 or 0.05, everyone (out of 8) for a price of 0.1, 0.75 (6 out of 8) for a price of 0.25 and 0.333 (2 out of 6) for a price of 0.4. There was a possibly significant negative correlation between price and fraction of rank egalitarian subjects ($r = -0.338$, $P < 0.05$; $\rho = -0.225$, n.s.), though this was largely driven by the 0.4 condition, and disappears if one removes these observations (e.g., $r = -0.031$, n.s.).

There is some evidence suggesting that the relationship works better in ordinal (rank) terms than in cardinal terms. If we label BurnObjectRatio the sum of all the burning of which a player is object, divided by the player's initial score, a genuine positive correlation between being object of burning and wealth should show up as a BurnObjectRatio increasing with wealth. This is the case when the Spearman correlation is computed, a rank-based measure ($\rho = 0.215$, $P < 0.05$), but not with the Pearson correlation ($r = -0.077$, n.s.).

Burning and wealth. Burning was not correlated with wealth: richer subjects did not burn more, or less ($r = -0.116$, n.s; $\rho = 0.022$, n.s.). There were 21 burners among Players 1 and 2, and 19 among Players 3 and 4. Define the "cost ratio" as the ratio of financial cost from burning to wealth. Among burners, the cost ratio was just 0.040 among Players 1 and 2, but some three times as large (0.129) among Players 3 and 4: the difference is significant at the 0.06 level ($t = 1.943$, d.f. = 38). Part of this significance is undoubtedly driven by the fact that Players 3 and 4 tended to be poorer (they did not receive the additional endowments), but, even if we look at the absolute cost values, we still find that Player 3 and 4 burners paid more to burn on average (1071.476) than Player 1 and 2 burners (885.474), although the difference is not significant ($t = 1.180$, d.f. = 38, n.s.). The evidence certainly does not suggest that poor, disadvantaged subjects paid less, whether that is because of the relative gap or because of the arbitrary way in which Players 1 and 2 got part of their wealth.[12]

[12] Since the differentials in endowments are correlated with differentials in scores, the present design does not properly allow to cleanly separate what is due to outcome-oriented envy and what is due to resentment towards the procedure used to allocate earnings. An attempt of doing so using an econometric technique is in Zizzo and Oswald (2001): the

Betting. Average betting was close to 50 in the practice and public betting. Players 1 and 2, who received 100 units every round, bet a mean 45.558 and 48.600 in the practice and public betting, respectively; players 3 and 4, who received 100 units in the practice rounds but 130 units in the public betting rounds, burnt 44.934 and 52.857, respectively.[13] Betting in the practice was correlated with betting later on, as we would expect ($\rho = 0.378$, $P < 0.001$). Public betting choices affected what were the initial scores in the burning stage, but, since bets were actuarially fair, we would not expect any systematic correlation between the two: this was indeed the case ($\rho = 0.080$, n.s.).

Demographic variables. Demographic variables tended to be uncorrelated with either betting or burning, although, among the 40 burners, students in Economics-related degrees tended to satisfy the rank egalitarian relationship less ($\rho = -0.289$, $P < 0.1$).

4. Discussion

When given an opportunity to burn money anonimously, almost 50% of the subjects chose to do so, or almost 40% when the price of burning was as high as 0.4. Did burners appear to care about how money was divided among other subjects? The answer is largely positive, as three out of four subjects seemed rank egalitarian, in a way that cannot (exclusively) be explained by spurious correlations: this empirical finding is in agreement with Charness and Rabin's (2000) but not Bolton and Ockenfels' (2000) model of interdependent preferences.[14]

It is interesting to compare these results to those of Zizzo and Oswald (2001): in their experiment, the money burning decisions of all players were implemented simultaneously. Average burning in Zizzo and Oswald (2001) was 839.629 units, against 526.352 in the corresponding conditions of the experiment of this paper.[15] This may be due, in part, to the different proportion of sessions in each marginal price, which was slightly tilted towards higher marginal prices in the present experiment.[16] In

technique is based on the intuition that a unit earned with an arbitrary extra endowment should be burnt more than a unit earned otherwise. What they find is that advantaged subjects tend to burn indiscriminately, whereas disadvantaged subjects tend to target the advantaged subjects. These results can be replicated with the present sample. However, since subjects who earn the extra endowments also earn more money in general, the technique might be considered controversial, and is not discussed here further.

[13] For a detailed analysis of the dynamics of betting decisions in an identical setting, see Zizzo (2001).

[14] It is incompatible with the basic Fehr and Schmidt's (1999, sections 1-5) model with linear inequality aversion terms; however, it would be compatible with their extended model with concave inequality aversion terms (briefly discussed in their section 6), since in this case large deviations from inequality bring greater disutility than small deviations.

[15] We exclude the 0.4 price condition for comparability, as Zizzo and Oswald (2001) did not have a corresponding condition.

[16] In Zizzo and Oswald (2001), there were seven sessions for the 0.25, 0.1 and 0.05 conditions, and eight sessions for the 0.02 conditions. This compares to the five sessions in the 0.25 and 0.1 conditions, and the four sessions in the 0.05 and 0.02 conditions, of the present experiment. Hence, even excluding the 0.4 price condition (see previous footnote),

order to control for this, we can compute a weighted average of burning, weighted according to the proportion of sessions for each marginal price in Zizzo and Oswald (2001). As this is 527.749, the difference in burning rates appears genuine. It is a difference not only in levels of burning but also in the sensitivity of burning to price, as burning appeared more unresponsive to price in Zizzo and Oswald (2001) than in the present experiment.

These differences suggest that expectations about other subjects' behavior, so relevant in Zizzo and Oswald (2001), may amplify the scope for money burning, both in terms of number of burners (about two thirds in that experiment) and in terms of amounts burnt (some 60% more). The finding is parallel to that of Fehr and Tyran (2001), where small distorsions from the standard economic prediction (in that paper, lack of money illusion) get amplified when agents need to take expectations about other players' behavior into account. In our design the anomaly (money burning) becomes more pervasive once a slightly more realistic setting, implying simultaneous burning by all players, is employed.

Of course realism has its limitations: it is hard to deny that most settings in developed countries are unlike the money burning environment of our experiment. This may not be the case for some transition and underdeveloped economies, however, and the present experiment provides a reminder and an estimation of the power of negatively interdependent preferences, at least over same range, whether out of envy or inequality aversion or other fairness concerns. In institutional settings where entrepreneurial success is considered as unfair (or due to witchcraft), we may expect the kind of behavior that, in a smaller and less dramatic way, we observed in the laboratory (see Choi 1993). There may also be settings in developed countries where damaging others at what can be a small or virtually zero expense of one's own material welfare may be realistic, particularly in small groups, as when a particularly successful workteam member is "taught a lesson" by the other members in the group (e.g. by withholding relevant information and otherwise sabotaging work, by engaging in scapegoating when reporting to managers, and so on). Voting is another important example where, often at a virtually zero cost, fairness or envy concerns can come to the fore in modern economies. They constitute arguments for the usage of progressive taxation (Banerjee 1990) and of a consumption tax (Frank 1997). The implementation of counter-cyclical stabilisation policy can be optimal once one allows for a desire for catching up with the Joneses (Ljungqvist and Uhlig 2000). The limited role of GDP growth as a measure of happiness, and the greater role that unemployment has, can also be explained in terms of relative

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the sample is slightly unbalanced towards a higher marginal price in the present experiment than in Zizzo and Oswald (2001).

utility (Oswald 1997). There are other potentially important implications, for example in terms of the possibility of upward-sloping demand curves (Bagwell and Bernheim 1997).

What should policy-makers do about negatively interdependent preferences? While envy has an intuitively negative welfare connotation, this is not necessarily true (Rawls 1971), and money burning can be due to fairness concerns which cannot be easily dismissed. Social engineering of preferences is anyway notoriously difficult though in principle not impossible (Zizzo forthcoming). Perhaps a better way to operate would be in terms of channelling these kinds of preferences in 'acceptable', and possibly welfare-improving, directions, rather than making them explicate in the money burning that we observed in the lab or that can be observed in the real world when given an opportunity: it is not hard to write models where, *if properly channelled*, envy can be an engine of rather than of an obstacle to development (e.g., Corneo and Jeanne 2001).

5. Conclusions

In the experiment presented in this paper, people can reduce ("burn") other subjects' money at a cost to their own: this cost is both absolute (in terms of earnings foregone) and relative (since a player loses standing relative to the subjects she is not burning). The decisions of one of the players then get implemented to determine final winnings (a "random dictator" design). We find that almost 50% of the subjects choose to burn; burners burn some 23% of the earnings of the other subjects. Money burning decreases with the price: we estimate the price elasticity of burning, and we find that it is inelastic up to a lower bound of about 0.22. Three subjects out of four appear rank egalitarian, providing support to theories of interdependent preferences that predict that agents care about how money is divided among other subjects. Relatively poor and disadvantaged agents did not burn less than more fortunate ones.

Overall, money burning appears a genuine phenomenon, and one that can get considerably amplified if subjects are allowed to burn simultaneously rather than according to a random dictator design. It strikingly mirrors the reality of some transition economies and underdeveloped countries where "the evil eye" can induce behavior closely resembling money burning, and which may hinder economic growth. But there may be nothing evil in the evil eye: it can reflect perfectly plausible fairness concerns. It will be more or less evil as far as policy-makers are concerned depending on the institutional settings in which it manifests itself.

Appendix A

Printed Instructions

(The instructions are reproduced for the price 0.25 condition; obvious small changes applied for different marginal prices).

BETTING PRACTICE INSTRUCTIONS

In this experiment you will use the computer to read information and make decisions.

Typically you will be asked to enter a number in one or more cells - such as that on the bottom-left corner of this screen - and to click some buttons. To input or change numbers, click the mouse pointer in the cell. You will then be able to type or erase numbers in the cell using the keyboard. Please always remember to type numbers as digits (say, 50) rather than as letters (say, fifty). You can give commands to the computer by clicking on the grey buttons at the appropriate times. Examples on the current screen are OK, Confirm, Cancel and Help. Note that only Help is currently highlighted, meaning that you can only click on Help right now (but please wait until you have read these instructions!). To press a button, click on it with the mouse pointer. Always click on Help to pass to the next screen of instructions.

IMPORTANT: please do NOT try to exit the experiment program even temporarily. Do NOT tamper with the computer in any other way (such as turning it off or removing the floppy disk). On various occasions you will be asked to click a button to check whether the other players have made their choices and the computer has made the necessary computations. Please, do NOT click the button continuously. Wait at least 10 seconds between attempts. You are NOT allowed to speak to any other participant in the experiment at any time. Further, if you need to speak to the experimenter, you should do quietly. If you have a query which the instructions are unable to solve, please raise your hand and we'll do our best to solve it - either on a piece of paper or with a low voice.

The above rules are essential for a smooth and speedy completion of the experiment. If you violate them, you may force everyone to lose much additional time, and you may be asked to leave the room and lose ALL gains AND the participation token. Thanks a lot!!!

The experiment is divided into four stages. The first stage is for practice. The second and third are the real experiment. The fourth stage is for the payment. We are going to use an experimental currency, the doblon. Your final doblon gains (except those of the practice stage) will be converted into UK pounds in the payment stage, at the rate of 0.6 pence per doblon. Unlike those earned later in the experiment, the doblons earned in the practice stage will NOT count towards your final gains and will NOT be convertable for money - the practice stage is only for practice, not to let you earn money! However, the doblons gained in the real experiment (stages 2 and 3) and which you still have by the end of stage will be converted into UK pounds in the payment stage. During the experiment your gains may go down as well as up. However, no player's balance will ever be allowed to fall below zero.

Moreover, whatever your final doblon gains from stage 2 and 3, you will be given an additional payment of 3 pounds for participation in stage 4.

WELCOME TO THE PRACTICE STAGE!
There are 10 rounds. Each round you receive 100 doblons for practice and you can choose to bet any amount of them, i.e. you can choose to bet between 0 and 100 doblons each round. Please write your choice in the left-down box of this screen.
To go ahead with your choice, press the OK button of the main screen and then Confirm. If you are not sure about your choice, even after having pressed OK, but before having pressed Confirm, press Cancel. After having pressed OK and Confirm, the computer randomly generates a number between 1 and 3. If you get 2 or 3 , you lose the money you bet. If you get a 1, you win: you keep the original amount of money you bet and gain double the amount (for ex., if you bet 100, you get 00 overall).

Example 1: Jill receives 100 doblons. She bets 50 doblons. Assume she wins. Then she retains the 50 doblons she bet (50), plus the money she did not bet (50), plus she earns 2x50=100 doblons more. So she earns a total of 200 doblons from the round. Now assume she loses. Then she is left with only the money she did not bet, that is with 50 doblons.
Example 2: Jamie receives 100 doblons. He bets 0 doblons. He wins 2x0 if a 3 is drawn, and loses 0 otherwise, so, whatever the number, he is left with 100 doblons.
Jane receives 100 doblons. She bets all of them. She wins 2x100 if a 3 is drawn, and loses 100 otherwise. So her overall winning from the round is 300 if she wins, and 0 otherwise.
Click Help to make this screen disappear and the first round start. Click Help another time to make the instructions appear again. Note: while these instructions are in view, you won't be able to take decisions.

BETTING STAGE INSTRUCTIONS
WELCOME TO STAGE 2 OF THE EXPERIMENT!!! In this stage you will play bets for real money, and this is why your score is 'restarting' from zero.
Players have been assigned a number according to the alphabetical order of their last names.
Players 1 and 2 get 130 doblons each round. Players 3 and 4 get 100 doblons each round. Each round you can bet from 0 up to the amount you receive each round (100 or 130). Put the number of doblons you are betting in the box in the bottom-left corner of the screen.

All players are given 100 doblons each round. Each round you can bet from 0 up to the amount you receive each round (100). Put the number of doblons you are betting in the box in the bottom-left corner of the screen.

To go ahead with your choice, press the OK button and then Confirm. If you are not sure about your choice, even after having pressed OK, but before having pressed Confirm, press Cancel. You can NOT change your choice for the round after having pressed BOTH OK AND Confirm.
After having pressed OK and Confirm, the computer randomly generates a number between 1 and 3. If a 1 is drawn, you win: you keep the money you bet and earn double the amount. If you get 2 or 3, you lose the money you bet.
To pass to the next screen, press the Help button.

There are ten rounds. After having pressed Confirm, and before passing to the following round, the computer will check whether the other players have made their choices. Once everybody has made her choice, the updated winnings of each player will appear on the screen.
Example: Jill receives 100 doblons. She bets 50 doblons and wins. Therefore she retains the 50 doblons she bet (50), plus the money she did not bet (50), plus she earns 2x50=100 doblons more. So she earns a total of 200 doblons from the round. Now assume she loses. Then she is left with only the money she did not bet, that is with 50 doblons.

In the meanwhile, Jamie receives 130 doblons. He bets 0 doblons. He wins 2x0 if a 1 is drawn, and loses 0 otherwise, so, whatever the number, he is left with 130 doblons.
Jane receives 130 doblons. She bets all of them. She wins 2x130 if a 1 is drawn, and loses 130 otherwise. So her overall winning from the round is 390 if she wins, and 0 otherwise.
Assume that Jill wins and Jane loses. Then, before passing to the following screen, on Jane's screen the new amounts, identified by number, of the other players will appear. For example, if Jamie is Player 1, it will appear that Jamie got 130 doblons more by the end of the round.

Click Help to make this screen disappear; a small label reminding your income per round will appear and you'll be able to start. Click Help again to make the instructions appear again. Note: while these instructions are in view, you won't be able to take decisions.

BURNING STAGE INSTRUCTIONS

In this stage, you have a chance to eliminate part or all of the winnings of any player (yourself included), and/or to transfer part or all of them from any player (again, yourself included) to any but NOT to yourself.

Each player is facing the same choices. After everyone has made his or her decision, the computer will determine randomly one player whose choices will be applied to everyone's winnings. IN OTHER WORDS, ONLY THE CHOICES OF ONE PLAYER, DETERMINED RANDOMLY, WILL BE TAKEN INTO ACCOUNT TO CHANGE FINAL WINNINGS. Every player has the same probability to be chosen by the computer to determine final winnings.

Since there are 4 players, this means that you have 1 chance out of 4 to be chosen by the computer to change final winnings, if so you wish. Players 1 and 2 get a GIFT of 500 doblons. Our compliments to players 1 and 2. Players 3 and 4 don't get any gift.

You have to pay a price for any activity of elimination of winnings. The price is 0.25 doblons per doblon eliminated, i.e. it takes 1 doblon (or fraction thereof) to eliminate 4 doblons.

You will be actually charged this amount *only* if you are the player randomly chosen by the computer to change final winnings. If this is not the case, your activity of elimination of winnings will have no impact whatsoever on your winnings. The total gains are the gains a player had until now, from income we gave her (including gifts) and from winnings. Further, the participation token can NOT be subject to any elimination activity.

Each row represents a player - the one in the first column from the left.
The second column from the left specifies the total amount of doblons we gave each player (=total endowment to the player) in stage 2 and 3. It includes the 1000 or 1300 doblons each player received in stage 2 - in 10 rounds of 100 or 130 doblons each -, plus, if any, the 500 doblons gift previously discussed.
The third column from the left has the total gains of the corresponding row player. It may be higher or lower than the endowment, according to the stage 2 performance.
The first column from the right displays the total gains after your activity.
To update this column, press View (it is also updated automatically when you press OK).
All these columns have a RED background. You cannot put any number yourself in any red cell.
You can plug and change numbers in the GREEN cells.
To eliminate gains, put the number of doblons gained by a player (and that you want to eliminate) in the green cell of the corresponding row.
You cannot at any time reduce the total gains of any player after your activity to below zero.
Within such limit, by paying the price, you can engage in whatever amount of elimination you wish.

Also remember that, in the end, only the final decision *of one player*, chosen randomly, will be applied. If, because of the random draw, your final decision gets applied (and, correspondingly, you pay the price), no one else's final decision will affect final winnings.

Before taking a final decision, you are encouraged to spend some time plugging numbers in the cells and viewing the outcome by pressing View, just to get a better understanding of how things work out.
Once you are happy with your choices, press OK and then Confirm. Press Cancel after OK if you change your mind. Once you press Confirm, you can NOT change your mind anymore.
IMPORTANT: all players have these same instructions in front of them right now.
The final gains of each player are determined as the SUM of the activity of elimination and transfer of winnings made by ALL players.
However, if such final gains are below zero, they are automatically raised to zero.

Any activity of transfer and elimination of gains will remain entirely ANONYMOUS both during and after the experiment.

After everybody has taken her decisions, a screen with the final winnings (final gains from this stage plus participation token) will appear.

Please stay seated. Payment will be done one at a time and each player will be asked to leave before payment is made to another player. This is to reinforce complete anonymity.

EXAMPLES: Assume there are two players, Jim (assume player 1) and Joe (assume player 3). Jim receives a 1000 doblons gift and starts with 2000 doblons, whereas Joe starts with 1000 doblons.

Ex. 1: Neither does any activity. Then Jim retains his 2000 doblons and Joe 1000.
Ex. 2: Assume now that there is also Jane, who has 500 initial total gains. Joe puts 2000 in the green cell in the player 1 row. Jim and Jane do nothing. If the computer randomly chooses Joe for eliminating winnings, then Joe gets 750 doblons (for he pays 0.25x1000=250) and Jim 0. If the computer chooses Jim or Jane, everyone stays with his or her initial score, including Joe.
Ex. 3: Jim eliminates 1000 doblons from Joe and 500 doblons from Jane. Jane eliminates 1000 doblons from Jim. Joe does nothing. If the computer chooses Jim for eliminating winnings, Jim gets 2000 - 375 (for he pays 0.25x1500=375) = 1625 doblons, while Joe and Jane get nothing (since Joe started with 1000 and Jane with 500 doblons, and Jim eliminates all of these earnings). If the computer chooses Jane, Jim gets 2000 - 1000 = 1000 doblons, Jane gets 500 - 250 (for she pays 0.25x1000=250 doblons) = 250 doblons, and Joe stays with his initial 1000 doblons. If the computer chooses Joe, everyone gets his or her initial score.

PLEASE TAKE YOUR FINAL DECISION WITH CARE. Both your and the other people's winnings depend on such decision.
To make a more careful choice, we encourage you again to try out various combinations and use View to see what would happen as the outcome of your activity.
This is the last screen of instructions, and once you click help again you'll be able to actually start working. However, feel free to browse your way through the instructions screens again at any time.

PLEASE START WORKING NOW.
First, make some PRACTICE clicking on View to see what happens when you make a choice.
Second, press OK if you are satisfied with your choice and press OK on the message box that will appear.
Third, press Confirm if you are positively sure about your choices. Otherwise press Cancel.
Click Help to get the instructions back on this screen.

Verbal Instructions

(These instructions were read aloud at the start of the burning stage; small changes to the second paragraph applied for marginal prices other than 0.25).

You are now in the third stage of the experiment. Players 1 and 2 receive a gift of 500 doblons. Players 3 and 4 receive no gift.

In the third stage, you have a chance to eliminate, if so you wish, some or all of the earnings of each player. To do this, you will need to spend some of your earnings at the rate of 0.25 doblons for each doblon you want to eliminate. In other words, you need to spend 1 doblon for each 4 doblons you want to eliminate. Whereas you can eliminate people’s earnings, it is not possible for you to increase your own earnings in this stage of the experiment.

Once all the players take their decisions on whether and how much to eliminate, the computer will choose randomly *one player* whose decisions will actually carried out by the computer in determining final winnings. The decisions of all the other players will be ignored, and, since they are ignored, they will not pay anything for whatever decision they have made.

What does it means that only the decisions of one player are actually carried out by the computer? It means that, in taking your decisions, you have to take into account that, if *you* are the one whose decisions are carried out, only *your* decisions will be carried out and affect final winnings – and *not* those of other players. In other words, if this is the case, you and you alone will have a chance to change final winnings if you wish and in the way you wish. So, if you are confused, just think at yourself and yourself alone as choosing what the final winnings of every player should be. Also, if you are confused, please raise your hand and we will be more than happy to help.

Each row on the top half of the screen represents a player, both yourself and the other players. In order to eliminate the earnings of a player, you have to insert the number of doblons you want to eliminate in the green cell corresponding to the player whose earnings you want to eliminate.

By clicking the View button, the computer will show what would happen as the outcome of your decisions. Nothing else will happen: in other words, as long as you click the View button, you are not taking any actual decision. We strongly recommend you that you do 5 or 10 minutes of practice by putting numbers in the various cells, clicking View and seeing what would happen if you actually wanted to choose those numbers. The reason we strongly recommend you to practice with the numbers is that only by making practice you will actually be able to make the decision which is best in your opinion.

It is your choice whether to eliminate winnings or not, but please note that there has to be a number in each cell, even if this number is zero, otherwise an error message will appear. Once you are happy with the numbers you have put, click the OK and then the Confirm button. Please note that, as long as you click the View button, it is only practice you are making. However, when you click OK and confirm, it is the real decision you are making, and, once you have made it, you cannot go back and change it. So please be careful about what you are doing before clicking OK and Confirm.

You will not be allowed to take any decision until you go through all the instruction screens. If you need to write something, please use the scratch paper and not the printed instruction sheets, as these need to be used in later sessions. Again, if you have any doubts, just raise your hand and we will be more than happy to help.

Appendix B

Experimental Data

Session	Player	Marginal Price	Initial Score	Burning of Score of Player 1	2	3	4
1	1	0.02	1100	100	0	300	0
1	2	0.02	2158	100	0	1600	0
1	3	0.02	678	50	0	0	0
1	4	0.02	500	50	0	0	0
2	1	0.25	2390	0	0	600	0
2	2	0.25	2280	40	0	0	0
2	3	0.25	1150	0	0	0	0
2	4	0.25	820	0	0	0	0
3	1	0.05	1670	1	1500	0	500
3	2	0.05	1880	1	0	0	700
3	3	0.05	1015	1015	1000	0	0
3	4	0.05	1230	1	1100	0	0
4	1	0.1	2020	0	100	0	0
4	2	0.1	1705	0	0	0	0
4	3	0.1	699	0	0	0	0
4	4	0.1	920	0	0	0	0
5	1	0.02	1841	0	0	0	1060
5	2	0.02	2539	0	0	0	1750
5	3	0.02	770	0	0	0	0
5	4	0.02	860	0	0	0	0
6	1	0.25	1600	0	0	0	1000
6	2	0.25	1800	0	0	0	1200
6	3	0.25	940	0	0	0	350
6	4	0.25	991	0	0	0	0
7	1	0.05	1650	0	250	0	0
7	2	0.05	2072	445	0	0	0
7	3	0.05	930	0	0	0	0
7	4	0.05	1250	0	50	0	0
8	1	0.1	2060	0	0	0	0
8	2	0.1	1920	500	0	0	0
8	3	0.1	1000	0	0	0	0
8	4	0.1	830	0	0	0	0
9	1	0.02	1789	10	0	1789	1
9	2	0.02	1725	50	0	0	1
9	3	0.02	950	70	0	0	1
9	4	0.02	1132	30	0	0	1
10	1	0.25	1965	0	650	320	0
10	2	0.25	1500	75	0	50	0
10	3	0.25	905	0	0	0	0
10	4	0.25	1200	25	0	320	0
11	1	0.05	2200	0	100	0	10
11	2	0.05	1757	0	0	0	5
11	3	0.05	1260	0	100	0	7
11	4	0.05	210	0	100	0	0

Session	Player	Marginal Price	Initial Score	Burning of Score of Player 1	2	3	4
12	1	0.1	2231	0	0	780	0
12	2	0.1	2000	1	0	550	0
12	3	0.1	1640	1	0	0	0
12	4	0.1	1800	1	0	350	0
13	1	0.02	2301	0	2301	0	600
13	2	0.02	1910	600	0	0	700
13	3	0.02	1313	0	1313	0	400
13	4	0.02	970	0	970	0	0
14	1	0.25	1858	0	0	0	0
14	2	0.25	1920	0	0	0	0
14	3	0.25	0	0	0	0	0
14	4	0.25	1042	0	0	0	0
15	1	0.05	2000	0	0	120	110
15	2	0.05	2570	0	0	370	250
15	3	0.05	1169	0	0	0	0
15	4	0.05	1220	0	0	0	0
16	1	0.1	1114	0	0	1114	0
16	2	0.1	1800	0	0	1800	0
16	3	0.1	530	0	0	0	0
16	4	0.1	927	0	0	927	0
17	1	0.4	1380	0	475	0	0
17	2	0.4	1870	0	0	170	0
17	3	0.4	1200	0	35	0	0
17	4	0.4	1180	0	35	80	0
18	1	0.4	2330	0	0	0	0
18	2	0.4	2151	0	0	0	0
18	3	0.4	1035	0	0	0	700
18	4	0.4	1087	0	0	100	0
19	1	0.4	1960	0	0	80	0
19	2	0.4	1480	0	0	50	0
19	3	0.4	702	0	0	0	0
19	4	0.4	960	0	0	30	0
20	1	0.4	1300	0	100	0	0
20	2	0.4	1830	0	0	0	0
20	3	0.4	1070	0	200	0	0
20	4	0.4	820	0	10	0	0
21	1	0.25	1749	0	0	11	4
21	2	0.25	1655	0	0	23	0
21	3	0.25	1162	0	0	35	0
21	4	0.25	1325	0	0	32	0
22	1	0.1	1895	0	1000	0	1000
22	2	0.1	1529	900	0	0	500
22	3	0.1	640	300	180	0	50
22	4	0.1	1100	750	250	0	0

References

Bagwell, Laurie S., and Bernheim, B. Douglas. "Veblen Effects in a Theory of Conspicuous Consumption." *A.E.R.* 86 (June 1996): 349-373.

Banerjee, Abhijit V. "Envy." In *Economic theory and policy*, edited by Bhaskar Dutta, Shubhashis Gangopadhyay, Dilip Mookherjee and Debraj Ray. Bombay: Oxford Univ. Press, 1990.

Bolton, Gary E., and Ockenfels, Axel. "ERC: A Theory of Equity, Reciprocity, and Competition." *A.E.R.* 90 (March 2000): 166-193.

Bosman, Ronald, and van Winden, Frans. "Emotional Hazard in a Power-To-Take Game Experiment." *Econ. J.* 112 (January 2002): 147-169.

Charness, Gary, and Rabin, Matthew. "Social Preferences: Some Simple Tests and a New Model." Department of Economics Working Paper no. E00/283. Berkeley: Univ. of California, Berkeley, 2000.

Choi, Young B. "Entrepreneurship and Envy." *Constitutional Political Econ*. 4 (Fall 1993): 331-347.

Clark, Andrew E., and Oswald, Andrew J. "Comparison-Concave Utility and Following Behaviour in Social and Economic Settings." *J. Public Econ.* 70 (October 1998): 133-155.

Corneo, Giacomo, and Jeanne, Olivier. "Status, the Distribution of Wealth, and Growth", *Scandinavian J. Econ*. 103 (June 2001): 283-93.

Elster, Jon. *The Cement of Society: A Study of Social Order*. Cambridge: Cambridge Univ. Press, 1989.

Fehr, Ernst, and Gachter, Simon. "Fairness and Retaliation: The Economics of Reciprocity" *J. Econ. Perspectives* 14 (Summer 2000): 159-181.

Fehr, Ernst, and Schmidt, Klaus M. "A Theory of Fairness, Competition, and Cooperation." *Q.J.E.* 114 (August 1999): 817-868.

Fehr, Ernst, and Tyran, Jean-Robert. "Does Money Illusion Matter?" *A.E.R.* 91 (December 2001): 1239-1262.

Frank, Robert H. "The Frame of Reference as a Public Good." *Econ. J.* 107 (November 1997): 1815-1831.

Jones, Stephen R. G. *The Economics of Conformism*. Oxford: Basil Blackwell, 1984.

Ljungqvist, Lars, and Uhlig, Harald. "Tax Policy and Aggregate Demand Management under Catching Up with the Joneses" *A.E.R.* 90 (June 2000): 356-366.

Mui, Vai-Lam. "The Economics of Envy." *J. Econ. Behavior and Organization* 26 (May 1995): 311-336.

Oswald, Andrew J. “Happiness and Economic Performance.” *Econ. J.* 107 (November 1997): 1815-1831.

Rawls, John. *A Theory of Justice*. Cambridge, Mass.: Belknap Press, 1971.

Schoeck, Helmut. *Envy*. London: Secker & Warburg, 1969.

Thomas, Keith. *Religion and the Decline of Magic*. Harmondsworth: Penguin, 1973.

Zizzo, Daniel J. “Empirical Evidence on Interdependent Preferences: Nature or Nurture?” *Cambridge J. of Econ.* forthcoming.

Zizzo, Daniel J. “Situational Determinants of Risk-Taking Behavior in a Lottery Race Game.” *Greek Econ. Review* 21 (Spring 2001): 37-51.

Zizzo, Daniel J., and Oswald, Andrew J. “Are People Willing to Pay to Reduce Others’ Incomes?” *Annales d’Economie et de Statistique* 63-64 (July/December 2001): 39-65.

FIG. 1 – Structure of the Experiment

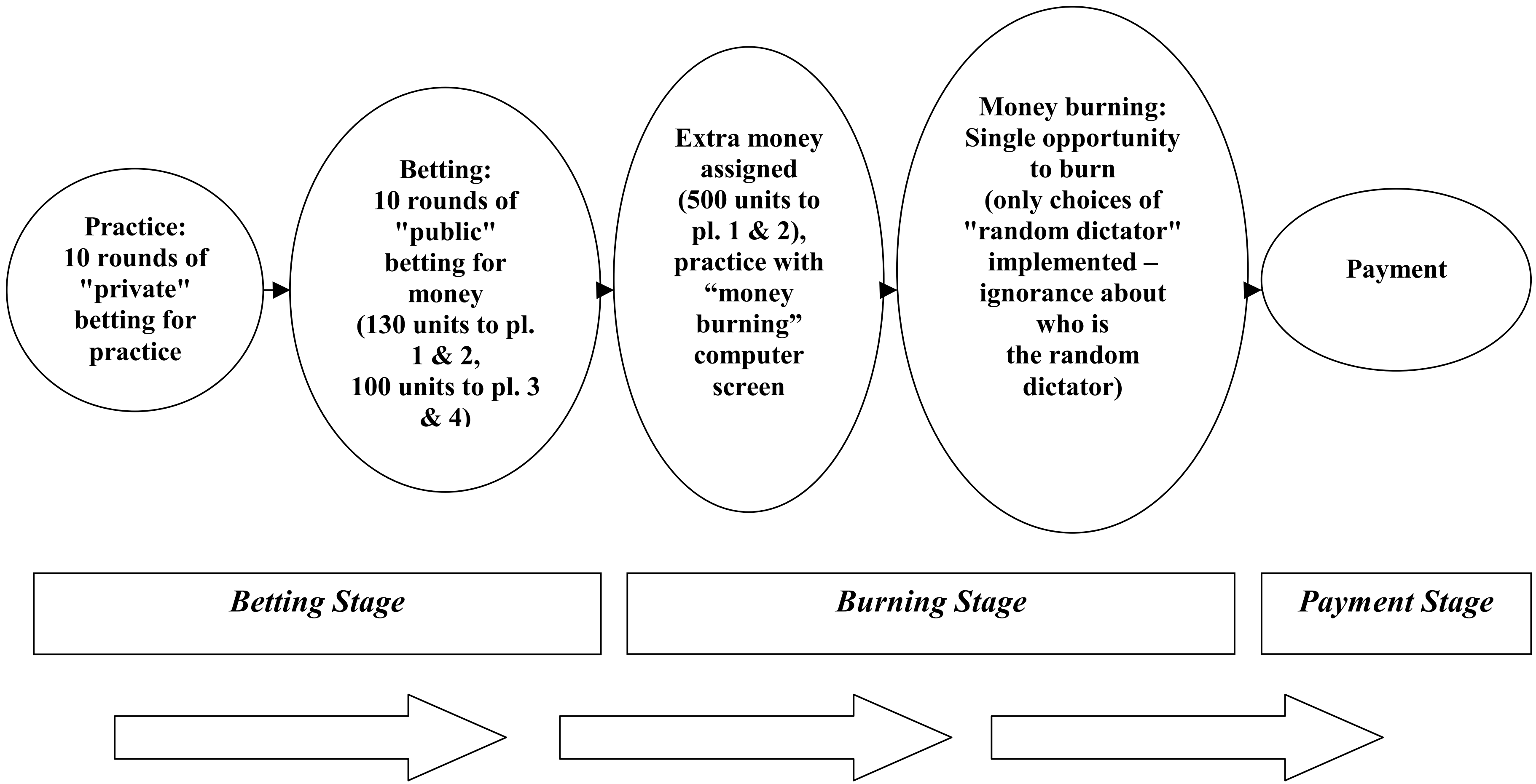

FIG. 2 – Example of Computer Screen from the Burning Stage

FIG. 3 - Average Burning By Subject

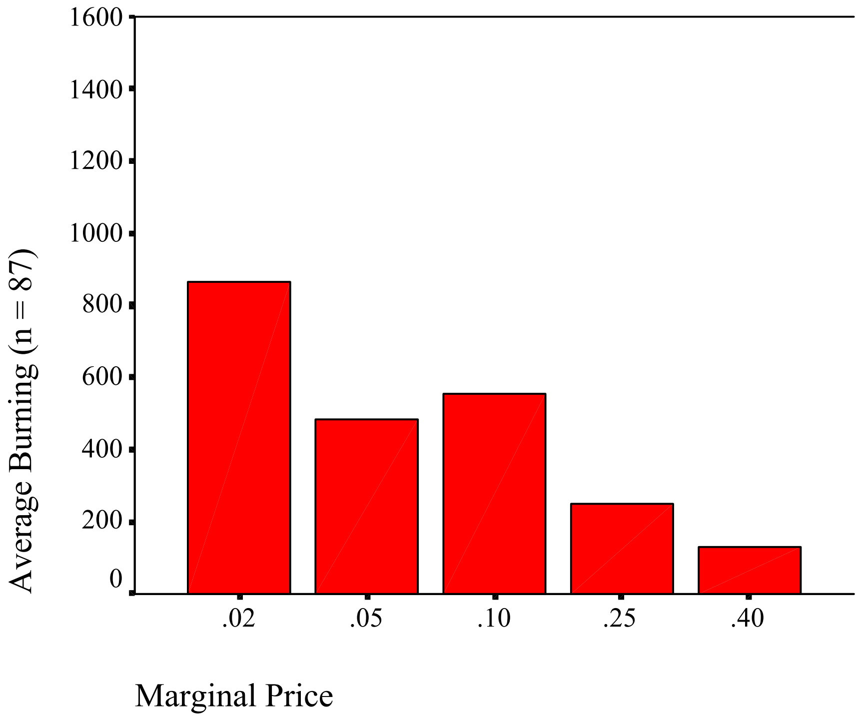

FIG. 4 - Average Burning Among Burners

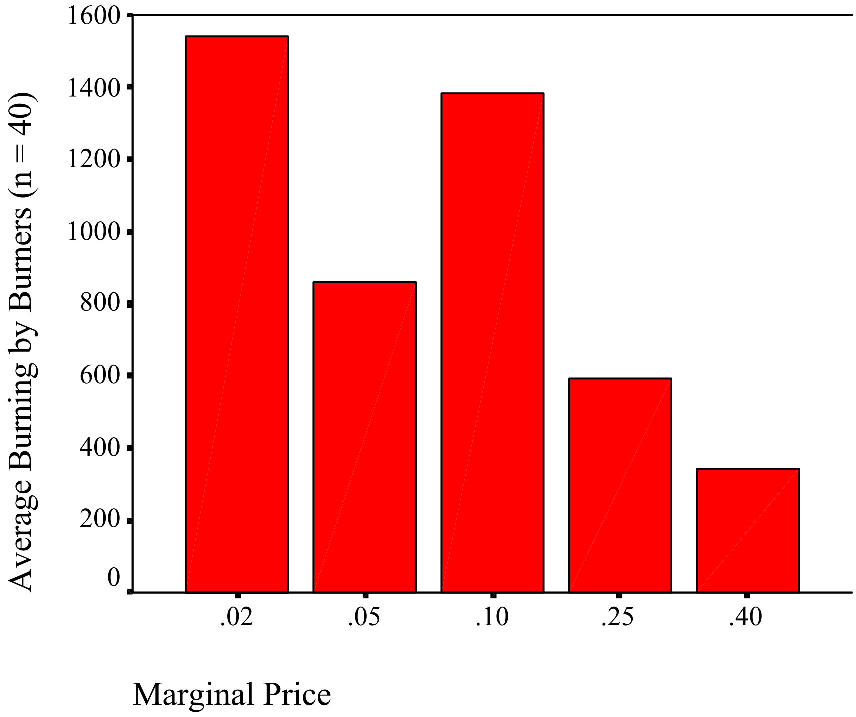

TABLE 1
PRICE ELASTICITY OF MONEY BURNING

Marginal Price	Elasticity Values: Using fitted y values	Elasticity Values: Using actual y values
0.02	-0.046	-0.036
0.05	-0.118	-0.155
0.1	-0.246	-0.251
0.25	-0.699	-1.066
0.4	-1.261	-2.378
Tobit Regression of Marginal Price on Burning (n = 87)		
Constant	198.467	
	(293.713)	
Beta	-2920.618	
	(1390.945)	
S.E. Regression	1527.493	
	(-186.691)	

NOTE. – y is the average amount burnt in each experimental condition. Elasticity estimates are computed using the Tobit regression estimates (reproduced in the lower part of the table) and the corresponding fitted average amounts burnt according to one method, or the actual average amounts burnt according to the other method.