Loss-induced Emotions and Criminal Behavior: An Experimental Analysis

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We analyze the influence of frustration and anger on committing a norm violation using a laboratory experiment. Subjects complete a real-effort task where compensation is framed as a gain or a loss and subsequently report experienced levels of different emotions categories. Lastly, subjects may increase their own income by taking away money designated for donation to charity. While both males and females experience higher levels of negative emotions in the loss frame than in the gain frame, we find that only men are more likely to take away money in the loss scenario.

Keywords: crime, experiment, norm violation.

JEL Classification: K14, C91, C92.

1. Introduction

According to standard economic theory, the decision to commit a norm violation like property crime does not differ much from other choices and can be studied using regular cost-benefit analyses (Becker 1968). In this view, a potential violator commits a crime if its expected gains outweigh the expected punishment, accounting for the violator’s attitude toward risk. Experimental evidence largely supports the general mechanism, i.e. that higher expected punishment leads to increases in deterrence. However, it is argued that...
the components of the cost-benefit tradeoff only explain a small fraction of the variation in crime rates (Glaeser 1999). This observation might be related to the often-questioned assumption that all criminals behave as rational utility maximizers (Garoupa 2003).²

In the criminological literature, the General Strain Theory (GST) takes a different perspective on explaining criminal behavior. Instead of focusing on the absolute outcomes people may achieve by criminal behavior, GST suggests that the perception of one’s relative position may be of greater importance. The theory states that “strains” can lead people to commit norm violations, including crime (Agnew 1992). A strain could be a failure to achieve positively valued goals or losing achievements (e.g. job, status) that one appreciates. It is hypothesized that such experiences trigger negative emotions, which may in turn favor crime. This explanation for the committing of norm violations has not received much attention in the economic literature on crime. Moreover, while survey data show correlations between strains and norm violations (Smith 1979; Broidy 2001), evidence following the conventions of the experimental literature is missing.

The idea that behavior depends on the perception of outcomes relative to some benchmark is also present in the behavioral economics literature. The seminal Prospect Theory by Kahneman and Tversky (1979, 1991) argues that risk-taking behavior depends on whether payoffs are perceived as gains or losses relative to a specific reference point. This is in contrast to standard expected utility theory which suggests that decision makers will only consider the possible absolute outcomes. Even the experience of prior gains or losses may affect subsequent decision taking. Bridging the gap between behavioral economics and GST, this may be explained by gains and losses invoking different positive and negative emotions in people where individual decision making is guided by a cognitive and an emotional decision system (see, van Winden and Ash 2012).

² While the classical law and economics literature supposes that crime is committed whenever it is optimal, fields such as psychology and sociology provide a variety of alternative explanations. An important aspect of those considerations is that certain situations may invoke criminal behavior, independent of whether it is beneficial for the individual (Gottfredson and Hirschi 1990).
In this paper, we test whether perceiving one’s position as a loss affects the decision for a norm violation resembling property crime. Motivated by the behavioral channels of General Strain Theory, we focus on the role of losses leading to strain and emotional responses. We implement a design in which we vary the compensation of a real-effort task to compare norm violations under loss framing to a benchmark case (gain frame). The payment scheme in the task ensures that absolute level of payoffs are equivalent in both variants, such that behavior should be identical if relative position did not matter. After the task, we elicit subjects’ positive and negative emotional states to measure how framing affects reported feelings. Finally, we present subjects with the possibility to take money that is intended for a charity in order to connect emotions to norm violations.

In the experimental analysis, we are able to isolate the effect of loss experiences from changes in income. In the field, this will typically not be possible, as the occurrence of strains often correlates with other drivers of crime. A laboratory environment allows to highlight which channels promote possible deviations in behavior from what standard economic theory would predict. For example, the real-world observation of someone losing her job poses a strain that will tend to go along with lower absolute income, thus altering the trade-off between expected gain and punishment from crime via several channels.

Another important feature of our design is that we can examine what role emotions play in the relation between loss experiences and norm violations. Our measure of emotional response is generally unavailable in field data and allows us to obtain details on which emotions affect norm violations and how strong the effects are. Potential concerns of mirroring crime in the laboratory environment are the stakes within the experiment. Accordingly, we use the more general term norm violation in this paper. Yet, our experimental design has a similar set-up to the experimental literature on crime (see, for example, Rizzolli and Stanca (2012) and Schildberg-Hörisch and Strassmair (2010)) and therefore allows the interpretation of norm violation as criminal behavior. Also, modeling
norm violations as subjects taking away from a donation to charitable organization has been used in recent contributions (Feess et al. 2015).

The propensity to engage criminally also depends on individual characteristics, with gender being an important determinant (Broidy and Agnew 1997). Behavioral economics has documented gender effects in several domains related to the trade-offs involved in crime. Dohmen et al. (2011) report that women are less likely to take risks, which may reduce their propensity to behave criminally. There is also evidence that men are more prone to overconfidence than women (Barber and Odean 2001). As a consequence, they might overestimate the probability of success of a crime.

Men and women might also deal differently with emotions caused by loss experiences, or – in the terminology of GST – strains. Previous research suggests that after experiencing negative situations, women tend to feel fear, while men tend to feel anger (Croson and Gneezy 2009, Section 2.3.1). Contributions in GST have found that males rather react to strain with outrage and crime, while women tend to respond with self-deprecating emotions (see the theoretical work of Broidy and Agnew (1997) and empirical evidence provided in Broidy (2001)). In light of this discussion, we also test whether the relation between loss experience, emotions, and the inclination to commit the norm violation is gender-specific.

We find that loss framing instills negative emotions like anger and frustration and reduces the reported levels of the positive emotions of satisfaction and happiness for both genders. However, loss-induced frustration and anger only lead to more norm violations for men, while women even tend to take less often in the loss frame. For both men and women, experienced levels of the positive emotions (happiness and satisfaction) have no explanatory power.

Our results contribute to the criminological and to the economics of crime literature.

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3. Data from the field suggests that men are far more likely to engage in criminal activities than women. In the United States, for example, nearly 80% of the violent crimes and about 62% of the property crimes were committed by men (Federal Bureau of Investigation 2014).
Whether strains positively affect crime has been examined in several contributions of the criminology literature. Typically, these papers use questionnaire data from university or schools, creating survey items that proxy emotional arousal and illegal behavior. The general hypothesis, that strains affect emotions, which in turn promote illegal behavior, has been supported (Broidy 2001; Leeper Piquero and Sealock 2004; Rebellon et al. 2009; De Coster and Cornell Zito 2010). However, using survey data makes this only a hypothetical decision for the subject.

In the context of the economic literature, Grolleau et al. (2016) show in a recent experiment that people cheat significantly more in an effort task in order to avoid losing an upfront payment than when payoffs are obtained ex-post. This result documents that the perception of outcomes as gains or losses may be a driver of norm-violating behavior, although such considerations are largely disregarded in standard economic models. In an experimental test of the deterrence hypothesis, Khadjavi (2014) shows that the existence of punishment in a stealing game leads to the suppression of pro-social feelings like shame and guilt that otherwise inhibit the decision to take away from the other player. van Winden and Ash (2012) provide theoretical considerations that stress the role of emotional factors, especially anger, in their influence on criminal behavior.

The remainder of this work proceeds as follows. In section 2, we describe the experiment and develop our hypotheses. Results are presented in section 3. A discussion concludes our study in section 4.

2. The experiment

2.1 Design

The experiment consists of three parts. The first part is a repeated real-effort task where subjects earn money by solving puzzles. In the second part, subjects self-assess their level of frustration, anger, satisfaction and happiness on a scale from one to seven. The last part addresses the norm violation decision. Here, subjects decide whether and to which degree
they want to take from a budget intended for a well-known charity. This way of modeling crime in the laboratory follows Feess et al. (2015). At the end of the experiment, all remaining donations were directly transferred to the charity. This process was transparent and observed by the participants.

The real-effort task is an encryption task where subjects translate a combination of letters (“puzzles” or “words”) into numbers using a randomly-generated legend (Benndorf et al. 2014). We use a repeated version in which subjects have ten two-minute periods to solve as many puzzles as possible. Subjects were familiarized with this task using an unincentivized trial period where 10 puzzles had to be solved correctly.

We consider two treatments that differ only in the framing of the payoffs in the real-effort task. In both treatments, subjects begin with an initial endowment and are paid according to their performance in the task. In the gain treatment, subjects start with €2. In each of the ten periods, they receive an additional €0.06 per solved puzzle for up to 15 puzzles. In contrast, subjects in the loss treatment start with €11 and lose €0.06 for each puzzle they fall short of 15 puzzles solved per period. The threshold of 15 puzzles per round was identical in both treatments. It was chosen as an unrealistic goal such that subjects in the loss frame would actually face losses.4 The payment schemes are mathematically equivalent, since

\[
2 + 0.06 \sum_{t=1}^{10} \min\{e_t, 15\} = 11 - 0.06 \sum_{t=1}^{10} (15 - \min\{e_t, 15\}),
\]

where \(e_t\) denotes the number of puzzles solved in round \(t\).

However, the remuneration evolves differently. For the same number of puzzles solved subjects in the gain frame see their total profits increase over time, while subjects in the loss frame face a decline in payoffs. The development of the total profits was displayed prominently on the subjects’ computer screens after each period of the real-effort task.

The possible norm violation in part three was introduced as follows. At the beginning

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4. There was one subject who managed to reach the threshold of 15 puzzles in all periods.
of the experiment, the participants were informed that an additional €5 were available per subject, which were intended as a donation to the “German Red Cross” charity. The German Red Cross (DRK e.V.) is a secular non-profit organization that seeks to help vulnerable people in case of disasters and health emergencies. Participants were presented with the option to take some (or all) of this money for themselves.

First, they had to indicate whether they wanted to take any money at all; if yes, they could afterwards state the amount $x \in \{0.02, 0.04, \ldots, 5.00\}$ they wanted to take away. Taking was successful with probability 85%, in which case the money was added to the participants’ earnings (and subtracted from the potential donation). With the remaining probability of 15%, the participant’s taking was unsuccessful and the attempted taking amount was returned to the charity donation. The participant then additionally had to pay a fine, also equal to $x$, from his/her cumulated earnings. This fine was not donated, but returned to the experimenters’ budget. By introducing the probabilistic fine, we align the subjects’ decision problem to how crime is depicted in standard economic models (Becker 1968).

2.2 Procedures

The experiment took place between October 2016 and February 2017 at the DICE Laboratory at the Heinrich Heine University Düsseldorf, Germany. Participants were recruited from the laboratory’s general subjects pool and invited using ORSEE (Greiner 2015). We conducted 8 sessions with a total of 161 subjects (80 females, 81 males). Each session lasted around 60 minutes and the participants earned 9.57 Euros on average. The experiment was programmed using the software z-Tree (Fischbacher 2007).

5. Most of the participants in the subject pool are students of various backgrounds from Düsseldorf University, but employees and external people may also take part in experiments. There were no restrictions for participation in this experiment.
2.3 Hypotheses

While subjects in the loss treatment repeatedly face losses during the real-effort task, subjects in the gain treatment see their profits increase over time. We thus argue that:

**Hypothesis 1.** The degree of self-assessed negative (positive) emotions will be higher (lower) in the loss frame compared to the gain frame.

Following GST, we anticipate that negative emotions lead to a higher inclination to commit norm violations. In the context of our experiment, this implies:

**Hypothesis 2.** (a) Subjects in the loss frame will be more prone to take money from the charity. (b) Elevated taking rates in the loss frame can be explained by higher degrees of frustration and/or anger.

We also test if these relations are different for males and females, in line with the literature on gender differences from the experimental and criminological literature discussed in the introduction.

2.4 Power analysis

In this subsection, we present the results of several power analyses we conducted using the g*Power software tool (Faul et al. 2007; Faul et al. 2009). All power analyses derive the minimum identifiable effect size using one-sided tests, a significance level of $\alpha = 0.05$ and assume normal distributions. We formulate a target power of $\Pi = 1 - \beta$, where $\beta$ is the probability of a type II error. Thus, $\Pi$ denotes the probability of identifying an effect, assuming that this effect actually exists. There are two scenarios considered for the sample size: a total of 160 observations (80 per group) for tests using the entire dataset, and a total of 80 observations (40 per group) for tests within an individual frame or gender.
For Hypothesis 1, we conduct power analyses based on Wilcoxon-Mann-Whitney tests. The emotions are measured on a Likert scale between 1 and 7. Concerning the difference in emotions between the gain and the loss frame, the test yields a minimum effect size of $d = 0.4$ for the full sample with 160 observations and $d = 0.57$ for the smaller sample with only 80 observations. In order to translate these effect sizes into the Likert scale, we assume a global mean of 4 and a standard deviation of 2 (as if all values were chosen with equal probability). An effect size of 0.4 would imply an increase to 4.4 for one group, while the mean of the other group would decrease to 3.6. For the smaller sample, an analogous effect would require shifts to 4.57 and 3.43, respectively.

The first part of Hypothesis 2 applies to the binary taking decision and is tested with Fisher’s exact tests. Here, we assume that the global share of subjects who try to take money will be about two thirds. If the differences between groups have the form $2/3 \pm z$, the full sample will allow for the identification of effects with $z \geq 0.1$, while the reduced sample will require $z \geq 0.14$. These values translate into odds ratios of $OR = 2.53$ for the large sample and $OR = 3.78$ for the small sample.

The results of the power analysis justify the selection of sample sizes in our experiment. For comparison, Dreber and Johannesson (2008) report that the share of men who send a deceptive message in an experiment is significantly higher than the share of women who do so (55% vs. 38%), which corresponds to an odds ratio of 1.99. The threshold for the larger sample suggests that we are able to reliably identify effects of slightly larger magnitude (e.g., 0.62 vs. 0.38). Moreover, both our samples are perfectly adequate to reveal strong effects such as the gender gap in tournament entry as reported by Niederle and Vesterlund (2007) ($OR = 5.02$).

We do not conduct a power analysis for amounts taken from the donation, as this would depend on the behavior in the binary decision of whether or not to take the money. One would additionally require further assumptions, producing weak conclusions. In the results section, we report the ex-post power of all the non-parametric tests we conducted.
3. Results

Before beginning the main analysis, we briefly discuss the effect of loss framing on the performance in the real-effort task. The average number of solved puzzles per period in the gain (loss) frame was 9.61 (9.60), with a median of 9.50 (9.65). This amount does not differ by frame (one-sided Wilcoxon-Mann-Whitney test, \( p = 0.342 \)). There is also no significant difference in performance across genders (one-sided Wilcoxon-Mann-Whitney test, \( p = 0.273 \)). The number of solved puzzles per period is on average 9.68 for men compared to about 9.53 for women. As a consequence, neither framing nor gender affected subjects’ performance in the real-effort task, such that differences in absolute payoffs cannot explain possible differences regarding the decision on the norm violation across frames or gender.

3.1 Induction of emotions

We first consider whether framing affects subjects’ emotional state as suggested by Hypothesis 1. Non-parametric Wilcoxon-Mann-Whitney tests (one-sided tests, all \( p < 0.001 \) and all \( \Pi > 0.94 \)) confirm that the loss frame significantly increases negative emotions (frustration and anger), while it decreases positive ones (satisfaction and happiness). This result is also supported by a regression analysis. Table 1 reports OLS regressions where the dependent variable is the self-assessed emotional state from the second part of the experiment.\(^6\) The coefficients for the loss indicator variable are significant and have the corresponding signs. The effects generally do not differ by gender, besides from weakly significant differences in satisfaction levels. The performance in the real-effort task as measured by the variable solved puzzles affects frustration and anger negatively, whereas it positively influences satisfaction and happiness.

\(^6\) Since the emotions were measured on a scale from 1 to 7, we also tested ordered probit models. They yield very similar results.
Table 1 OLS estimations for emotions

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>frustration</th>
<th>anger</th>
<th>satisfaction</th>
<th>happiness</th>
</tr>
</thead>
<tbody>
<tr>
<td>loss</td>
<td>0.745**</td>
<td>0.638*</td>
<td>–0.554**</td>
<td>–0.849***</td>
</tr>
<tr>
<td>(0.370)</td>
<td>(0.371)</td>
<td>(0.275)</td>
<td>(0.301)</td>
<td></td>
</tr>
<tr>
<td>female</td>
<td>0.044</td>
<td>–0.232</td>
<td>0.563*</td>
<td>0.230</td>
</tr>
<tr>
<td>(0.386)</td>
<td>(0.361)</td>
<td>(0.326)</td>
<td>(0.314)</td>
<td></td>
</tr>
<tr>
<td>loss × female</td>
<td>0.558</td>
<td>0.888</td>
<td>–0.861**</td>
<td>–0.403</td>
</tr>
<tr>
<td>(0.549)</td>
<td>(0.553)</td>
<td>(0.426)</td>
<td>(0.420)</td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>–0.028</td>
<td>–0.041**</td>
<td>0.007</td>
<td>–0.008</td>
</tr>
<tr>
<td>(0.023)</td>
<td>(0.019)</td>
<td>(0.015)</td>
<td>(0.014)</td>
<td></td>
</tr>
<tr>
<td>solved puzzles</td>
<td>–0.262***</td>
<td>–0.195**</td>
<td>0.283***</td>
<td>0.254***</td>
</tr>
<tr>
<td>(0.087)</td>
<td>(0.081)</td>
<td>(0.077)</td>
<td>(0.086)</td>
<td></td>
</tr>
<tr>
<td>constant</td>
<td>6.814***</td>
<td>5.709***</td>
<td>0.398</td>
<td>1.078</td>
</tr>
<tr>
<td>(1.242)</td>
<td>(1.080)</td>
<td>(1.004)</td>
<td>(1.063)</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.13</td>
<td>0.14</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>No of obs.</td>
<td>161</td>
<td>161</td>
<td>161</td>
<td>161</td>
</tr>
</tbody>
</table>

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Robust standard errors in parentheses. The variable solved puzzles denotes the average number of solved puzzles per round.

Result 1. We confirm Hypothesis 1. The degree of frustration and anger (satisfaction and happiness) are significantly higher (lower) in the loss frame compared to the gain frame.

3.2 Loss framing and norm violation

Next, we investigate the relation between norm violations and framing. The data for the binary taking decision is summarized in Figure 1. There are virtually no differences between the gain and loss frame when we consider the full sample (one-sided Fisher’s exact test, $p = 0.434$). This changes when we distinguish between male and female subjects. Men take significantly more often in the loss frame compared to the gain frame (one-sided Fisher’s exact test, $p = 0.012$, $OR = 3.76$, $\Pi = 0.74$). However, the taking rate of women is significantly lower in the loss frame compared to the gain frame (one-sided Fisher’s exact test, $p = 0.041$, $OR = 2.51$, $\Pi = 0.56$).
Figure 1 Share of subjects who try to take money from the charity by frame and gender.

**Result 2.** We confirm Hypothesis 2 (a) for males, and reject it for females. Men are more prone to take money from the charity in the loss frame compared to the gain frame, but the opposite is true for women.

Considering overall gender effects across both frames, men try to take money from the charity more frequently than women (one-sided Fisher’s exact test, $p = 0.019$, $OR = 2.08$, $I = 0.64$). This effect is only driven by the behavior in the loss frame. Men take significantly more often than women in the loss frame (one-sided Fisher’s exact test, $p < 0.001$, $OR = 6.92$, $I = 0.98$), but taking rates do not differ by gender in the gain frame (one-sided Fisher’s exact test, $p = 0.342$).

Put differently, while behavior in the benchmark case does not differ across genders, the reactions to the loss frame go exactly in opposing direction. Here, the taking rates increase for men, but decrease for women. This suggests that strains (as defined by GST) take different tolls from men and women resulting in gender differences in the way people deal with negative emotions.
Men do not only take more often, but also *higher* amounts on average compared to women. Table 2 summarizes the amount taken by frame and gender conditional on a positive amount being taken. The mean of the amounts taken is higher in the loss frame than in the gain frame for males (200.1 vs. 162.6). The opposite holds for female, where higher average take amounts are observed in the gain frame (169.8 vs. 145.1). To compare these figures quantitatively, Figure 2 displays the cumulative distribution functions of the amounts taken for men and women when both frames are pooled. Again, we include only those 108 subjects who took a positive amount.

It can be seen that (i) men take higher amounts than women (one-sided Wilcoxon-Mann-Whitney test, $p = 0.013$, $d = 0.34$, $\Pi = 0.52$) (ii) this effect is driven by the behavior in the loss frame, where we find a substantial and significant effect (one-sided Wilcoxon-Mann-Whitney test, $p = 0.001$, $d = 0.79$, $\Pi = 0.84$) while (iii) there is no gender effect in the gain frame (one-sided Wilcoxon-Mann-Whitney test, $p = 0.448$). As for the differences in the amounts taken across frames, we find a weakly significant effect in that men take more money in the loss frame compared to the gain frame (one-sided Wilcoxon-Mann-

<table>
<thead>
<tr>
<th></th>
<th>male</th>
<th>female</th>
<th>all</th>
</tr>
</thead>
<tbody>
<tr>
<td>gain frame</td>
<td>162.6</td>
<td>169.8</td>
<td>166.6</td>
</tr>
<tr>
<td></td>
<td>(97.1)</td>
<td>(73.9)</td>
<td>(84.1)</td>
</tr>
<tr>
<td></td>
<td>[25, 250]</td>
<td>[13, 250]</td>
<td>[13, 250]</td>
</tr>
<tr>
<td>loss frame</td>
<td>200.1</td>
<td>145.1</td>
<td>182.4</td>
</tr>
<tr>
<td></td>
<td>(66.6)</td>
<td>(63.0)</td>
<td>(69.9)</td>
</tr>
<tr>
<td></td>
<td>[15, 250]</td>
<td>[50, 250]</td>
<td>[15, 250]</td>
</tr>
<tr>
<td>both frames</td>
<td>186.0</td>
<td>160.4</td>
<td>174.8</td>
</tr>
<tr>
<td></td>
<td>(80.8)</td>
<td>(70.3)</td>
<td>(77.1)</td>
</tr>
<tr>
<td></td>
<td>[15, 250]</td>
<td>[13, 250]</td>
<td>[13, 250]</td>
</tr>
</tbody>
</table>

**Notes:** For positive amounts of taking. No. of obs. = 108. Columns display mean, (standard deviation) and [minimum, maximum].
Whitney test, $p = 0.079$, $d = 0.46$, $\Pi = 0.51$), but there are no significant differences when considering only women or the full sample (one-sided Wilcoxon-Mann-Whitney test, both $p > 0.103$). Thus, we conclude that men react more strongly to loss framing by taking higher amounts than women.

3.3 Emotions and norm violation

In order to shed light on the different reactions to the loss framing, we study the relation between reported emotions and the norm violation. The results from different probit models explaining the taking decision are presented in Table 3. The emotions frustration, anger, satisfaction, and happiness are considered separately.\(^7\) The regressions are split according to the frame and a female indicator and its interaction with the feelings category are included. This allows emotions to have different effects across the two treatments, as

\(^7\) We do not run a model including all emotions at the same time, as there are problems of multicollinearity in such a model (several Variance Inflation Factors of this model are well above 10).
Table 3 Probit estimations of the taking decision

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>gain</td>
<td>loss</td>
<td>gain</td>
<td>loss</td>
</tr>
<tr>
<td>female</td>
<td>1.191*</td>
<td>0.493</td>
<td>0.477</td>
<td>–0.022</td>
</tr>
<tr>
<td></td>
<td>(0.689)</td>
<td>(0.837)</td>
<td>(0.582)</td>
<td>(0.671)</td>
</tr>
<tr>
<td>frustration</td>
<td>0.054</td>
<td>0.334**</td>
<td>(0.133)</td>
<td>(0.162)</td>
</tr>
<tr>
<td>female × frustration</td>
<td>–0.103</td>
<td>–0.422**</td>
<td>(0.148)</td>
<td>(0.176)</td>
</tr>
<tr>
<td>anger</td>
<td>0.044</td>
<td>0.402**</td>
<td>(0.143)</td>
<td>(0.176)</td>
</tr>
<tr>
<td>female × anger</td>
<td>–0.103</td>
<td>–0.422**</td>
<td>(0.148)</td>
<td>(0.176)</td>
</tr>
<tr>
<td>satisfaction</td>
<td>0.011</td>
<td>0.007</td>
<td>0.011</td>
<td>0.007</td>
</tr>
<tr>
<td>female × satisfaction</td>
<td>–0.135</td>
<td>–0.106</td>
<td>0.023</td>
<td>–0.104</td>
</tr>
<tr>
<td>happiness</td>
<td>0.05</td>
<td>0.21</td>
<td>0.02</td>
<td>0.21</td>
</tr>
<tr>
<td>female × happiness</td>
<td>0.194</td>
<td>–0.218</td>
<td>(0.202)</td>
<td>(0.227)</td>
</tr>
<tr>
<td>age</td>
<td>0.011</td>
<td>0.007</td>
<td>0.011</td>
<td>0.007</td>
</tr>
<tr>
<td>solved puzzles</td>
<td>–0.135</td>
<td>0.033</td>
<td>–0.106</td>
<td>0.023</td>
</tr>
<tr>
<td>Pseudo $R^2$</td>
<td>0.05</td>
<td>0.21</td>
<td>0.02</td>
<td>0.21</td>
</tr>
<tr>
<td>No. of obs.</td>
<td>79</td>
<td>82</td>
<td>79</td>
<td>82</td>
</tr>
</tbody>
</table>

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All columns report coefficient estimates. Robust standard errors in parentheses. Dependent variable = 1 if (part of) the donation was taken. The variable solved puzzles denotes the average number of solved puzzles per round.

well as by gender. The latter is important because it is suggested that men and women differ in their emotional reactions to strains and in the effect of these emotions on criminal behavior (Broidy 2001). The control variables age and solved puzzles are also included, but both are insignificant in all specifications.

We find that none of the reported feelings impact taking behavior in the gain frame. This is consistent with the notion that the gain frame serves as a reference where the emotional state of the subjects is normal. Furthermore, positive feelings do not affect taking behavior in any frame, as the corresponding coefficients are all insignificant. This is in line with
GST, which states that the category of negative emotions are the ones triggering crime.

Frustration and anger do affect the taking decision in the loss frame and their effect depends on gender. Higher reported frustration and anger increase taking for men, but not for women. The sum of the coefficient of the feeling and its interaction with female is not statistically different from zero.

This is also illustrated in Figure 3, where we plot the predicted probabilities for taking at all possible emotion levels by gender as they result from the regressions reported in Columns (1) and (2). The left panels depict the results for the gain frame. They show that there are no significant differences across genders (confidence intervals) and that the taking probabilities are rather insensitive to the feelings (slopes). The right panels of the figure display these relations in the loss frame. The taking probability is increasing in frustration and anger for men and this marginal effect is significant. For women, a negative, but insignificant relation results.

Result 3. We confirm Hypothesis 2 (b) in that males’ elevated taking rates in the loss frame can be explained by higher degrees of frustration and anger.
Figure 3. Predicted taking probabilities and 95% confidence interval of the taking decision (Table 3, Cols. 1-2), displayed at different levels of frustration and anger, by gender and frame.

4. Discussion and conclusion

Using a laboratory experiment, we investigated how experiencing a prior outcome as a loss affects the inclination for committing a gainful norm violation. We framed income of a real-effort task as gains or losses and gave subjects the option to take away money designated for a charity afterwards. Collecting self-assessed emotions, we are able to link losses, induced feelings, and norm violations.

We find that only men react to anger and frustration induced by the experience of losses by being more likely to take away from the donation. For females, we can only confirm the first link between losses and negative emotions, but do not find a higher probability of committing the norm violation. These results relate to Buser (2016), who finds a gender effect in the context of competition. In his experiment, men react to the experience of losing by selecting higher goals for themselves, while women rather choose lower goals.
as a reaction. Therefore, it seems that men and women deal differently with emotions. The idea of experiences causing emotional reactions which affect future decisions is also present in Beisswingert et al. (2015). They show that the experience of losing control causes anger and leads to less risk-aversion in a subsequent task, which generally is in line with what we find for men in our loss scenario.

The findings of our experiment link to several strands of the literature. A growing literature in economics has shown that emotions are important for decision making (Bosman and Winden 2002; Loewenstein 2000). Andrade and Ariely (2009) focus on transient emotions, which arise in certain circumstances and can affect behavior in seemingly unrelated, subsequent situations. Using dictator and ultimatum games, they show that incidental states translate to other decision making contexts. Our experiment, where framing of compensation affects the decision to take away from a donation, shows such an effect in another context.

The results also speak to the criminological literature. Importantly, we confirm the hypothesized chain of GST, using an improved experimental design compared to previous studies. Our result also adds to the discussion on gender differences criminal behavior which has delivered mixed results so far (Leeper Piquero and Sealock 2004; Rebellon et al. 2009; De Coster and Cornell Zito 2010). More generally, the heterogeneity between male and female subjects that exists in the likelihood of committing the norm violation presents a further domain where men and women tend to behave differently (Croson and Gneezy 2009). These differences could be further explored in future studies.

Our results add to understanding the factors that contribute to committing norm violations and crime. In particular, we identify loss experiences leading to negative emotions as one way in which criminal behavior may be provoked. The experimental evidence documents important gender differences that cannot be derived from standard economic theory. It seems that the GST is more suitable for explaining the behavior of men compared to women.


**APPENDIX**

**Experimental instructions** (translated from German; not intended for publication)

In the following experiment, you can earn money depending on your behavior.

Please turn off your mobile telephone and do not talk to the other participants. It is very important that you comply with these rules. Should you have any questions during the experiment, please raise your hand. We will come to you immediately and answer your questions individually.

During the experiment, you can earn Taler according to your decisions. At the end of the experiment, the Taler earned will be exchanged to Euro at a rate of

\[
50 \text{ Taler} = 1 \text{ EURO}
\]

and will be paid out to you in cash.

Today’s experiment consists of two phases. First, there is a task, which you will have to work on. This will be described in more detail below. The more successful you are in this part, the higher your income is. After that, you will make a one-time decision that can further influence your income.

**Working phase**

A practice phase will take place as a first part of the experiment, so that you can get acquainted with the task at hand. In a next step, the actual working phase will take place.

In the practice phase, all participants have to solve 10 puzzles correctly. Please note that solving the puzzles correctly in the practice phase does not lead to earnings.

The working phase lasts **10 periods, and every period takes two minutes**. Your task is solving puzzles correctly, which is explained in more detail in the next paragraph. Solving a puzzle consists of correctly encrypting one word.

As mentioned before, your performance in the working phase influences your income. You start with an initial budget of **100 Taler** that you have for participating in the experiment. You can influence your total income by solving puzzles.

The compensation scheme for this is as follows: if you correctly code 15 words or less in this period, you gain **3 Taler** for every word up to this threshold. If you solve 15 words or more, these additional words do not influence your payment and you will receive the same payment as if you had only coded 15 words correctly.

In addition, and independent of your performance in this task, an amount of **250 Taler** per participant is planned as a donation for the German Red Cross (GRC). In its charter, the GRC describes its goals as follows:

> The German Red Cross assumes the interests of those who are in need of help and support, in order to abolish social discrimination, hardship and degrading situations and to work toward improving the individual and social living conditions and those in the family.

The GRC is awarded the DZI seal of approval, which confirms the compliance with economic, legal and ethical criteria. All donations that are generated by this experiment are passed on 100% to the GRC, the donation will take place live right after the experiment.

8. The italic part reads as follows for the loss scenario.

As mentioned before, your performance in the working phase influences your income. You start with an initial budget of **550 Taler** that you have for participating in the experiment. You can influence your total income by solving puzzles.

The compensation scheme for this is as follows: if you correctly code 15 words or less in this period, you lose **3 Taler** for every word falling short of this threshold. If you solve 15 words or more, these additional words do not influence your payment and you will receive the same payment as if you had only coded 15 words correctly.
A.1.1 Description of the task

The task consists of encrypting combinations of letters (words) into numbers. In the task, three capital letters always yield a word. You have to allocate a number to each capital letter. The encryption code can be found in a table below the corresponding letter. For that purpose, please consider the following screenshot: In this example, the participant has already encrypted three words correctly (see centered field: above). Here, the three capital letters: “Z”, “N” and “T” have to be encoded. The solution follows immediately from the table:

- For “Z” applies: 684 (see the current entry of the participant)
- For “N” applies: 357
- For “T” applies: 848

To make an input please click on the blue box below the first capital letter. Furthermore, the screen (see screenshot) provides the following information:

- “Number of correct solutions” = number of correctly encrypted words.
- “Remaining time [sec]” = remaining time in the current period.
- “You currently encrypt word number” = current word to encrypt.

**If all 3 numbers have been entered, please click the “OK” button.**

The computer then checks whether all capital letters haven been encoded correctly. Only then, the word is counted as correctly solved. Thereafter a new word (again consisting of three capital letters) is randomly drawn. Furthermore, a new encryption table is randomly generated in two steps:

1. The computer program randomly selects in the table a new set of three-digit numbers to be used for the encoding of the capital letters.
2. Additionally, the computer program shuffles the position of the capital letters in the table. Please note that the program always uses all 26 capital letters of the German alphabet.

**Please note that if a new word appears, you have to click with your mouse on the first of the three blue boxes. Otherwise, no input is possible!**

The computer will mark (in red font) wrong inputs after pressing the “OK” button.

**Bear in mind:**

After wrong inputs the current word to encode will not change until a correct input was made. However, your previous inputs (in the 3 boxes below the capital letters) will all be deleted. Furthermore, the table stays unaltered, meaning that the allocated numbers remain identical. Also the position of the capital letters in the table does not change.
Hints:

Please note that after having entered the three-digit number you can easily switch to the next blue box by using the tabulator key on your keyboard.

In the following picture, you can see the position of the tabulator key on your keyboard:

The input of the numbers can be performed faster by using the numpad (on the right) of your keyboard.

In the following picture you can see the position of the numpad on your keyboard:

Decision phase

In this part, you can try to take away some of the 250 Taler that are designated for the German Red Cross in order to receive it for yourself.

If you would not like to do this, click “No” and your income does not change. If you do want to do this, first click “Yes”. On the next screen, you can then try to take an integer amount between 1 and 250 Taler.

With a probability of 85% taking the Taler is successful, you will receive the amount chosen and you can keep it for yourself. With probability 15% you do not receive the amount. Instead, the amount you have chosen will be subtracted from your cumulated earnings (including your initial budget) in this case.

If you have taken an amount, but this has not been successful, the German Red Cross will receive the full 250 Taler. However, the German Red Cross will not receive the amount that gets subtracted from your income in this case.

Your decision remains secret and will not be made public at any point.